Case Report

Diagnosis and Management of Post-traumatic Pulmonary Pseudocyst

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Post-traumatic pulmonary pseudocyst is an uncommon cavitary lesion of the lung, which generally develops after blunt chest trauma. We saw a 22-year-old man with chest trauma, hemopneumothorax, and hemoptysis, on the day he fell from an electrical pylon. Intubation in the emergency department was followed by 4 days of mechanical ventilation. Computed tomogram found a post-traumatic pulmonary pseudocyst. On hospital day 6 he developed pneumonia, which we treated with ceftazidime plus gentamycin. He was discharged on hospital day 20, and a month later the pseudocyst had resolved without complications. Diagnosis of post-traumatic pulmonary pseudocyst may require computed tomography, and some complicated cases may require surgery. *Key words: post-traumatic pulmonary pseudocyst, trauma, cyst, lung, tomography*. [Respir Care 2009;54(4):538–541. © 2009 Daedalus Enterprises]

Introduction

Post-traumatic pulmonary pseudocyst is an uncommon complication after blunt or penetrating chest trauma. Young adults and children are most commonly affected.[1] Chest computed tomography (CT) is important for early diagnosis.[2] Spontaneous remission is the usual outcome, but sometimes surgery is required.[1,3] Post-traumatic pulmonary pseudocyst should be included in the differential diagnosis of cavitary pulmonary lesions.

Case Report

A 22-year-old male electric technician was admitted to our emergency department on the day he fell from an electrical pylon. The patient had developed hemopneumothorax, and a chest tube had been placed at a local hospital. Physical examination revealed subcutaneous emphysema, tachypnea, and hemoptysis. Posteroanterior chest radiograph showed massive subcutaneous emphysema and consolidation of the left lung (Fig. 1). CT revealed consolidation throughout the left lung and posterobasal segment of the right lung, and chest-wall emphysema (Fig. 2).

Sedation and intubation were performed due to agitation, and he was admitted to the intensive care unit for mechanical ventilation, with the diagnosis of aspiration and pulmonary contusion. Frequent endotracheal suctioning was performed to prevent airway obstruction from the hemoptysis. His clinical status improved substantially on volume-controlled continuous mandatory ventilation with positive end-expiratory pressure (PEEP) of 5 cm H_2O, tidal volume of 7 mL/kg predicted body weight, and inspiratory-expiratory ratio ranged from 1:1 to 1:3. We adjusted the respiratory rate and tidal volume to achieve pH of 7.35–7.45 and plateau pressure of $\leq$ 30 cm H_2O. We adjusted the fraction of inspired oxygen to achieve P_{aO_2} of $\geq$ 80 mm Hg. There was no evidence of patient-ventilator dyssynchrony, and we administered neuromuscular blocker until we began weaning him from mechanical ventilation. On hospital day 4 we no longer found blood in the suctioned secretions, and we extubated.

On hospital day 6 he had a fever of 38.6°C, leukocytosis (white-blood-cell count 17.8 cells/μL), purulent sputum, and polymorphonuclear leukocytes ($>$ 25 neutrophils per 100-power field), and the diagnosis was hospital-acquired pneumonia. Although no microorganisms were identified in the thick sputum culture, we empirically started a 7-day course of intravenous ceftazidime (1 g every 8 h) plus gentamycin (80 mg every 8 h), per the Turkish Thoracic Society guidelines on hospital-acquired pneumonia.[4] Blood cultures and fungal serology were negative.

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The authors declare no conflicts of interest.

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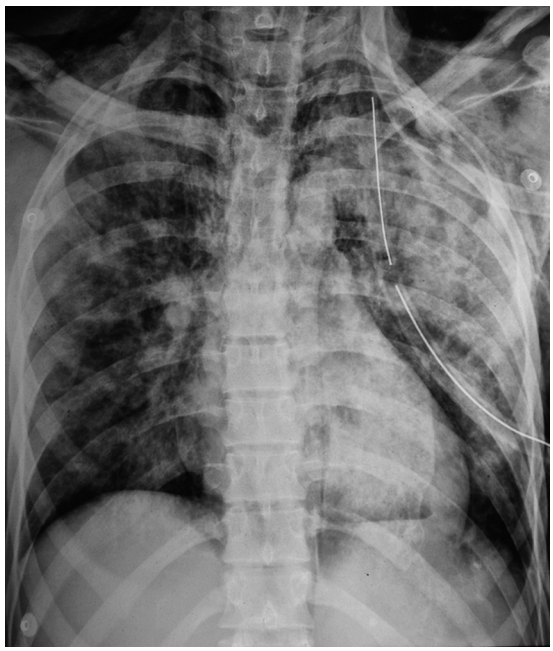

Fig. 1. Chest radiograph shows massive subcutaneous emphysema and consolidation of the left lung.

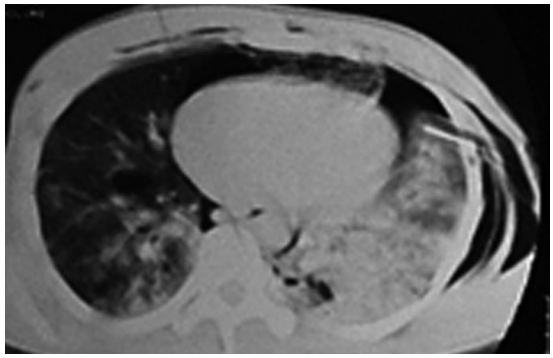

Fig. 2. Computed tomogram shows consolidation throughout the left lung and posterobasal right lung, and chest-wall emphysema.

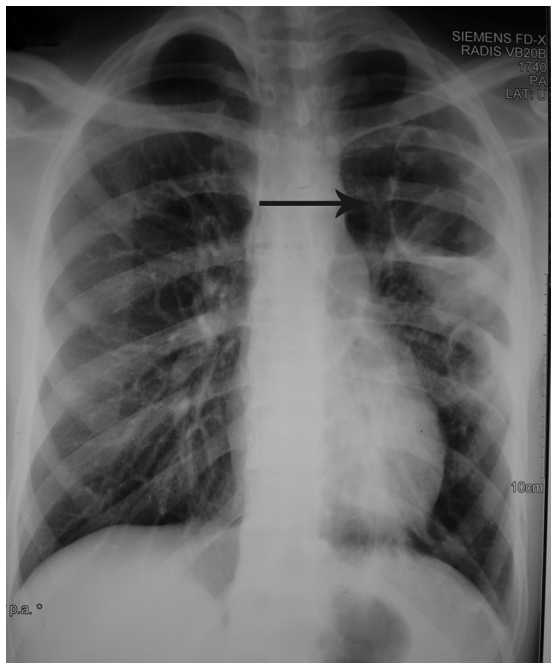

Fig. 3. Chest radiograph shows a left-lung cavitary lesion with an air/fluid level (arrow).

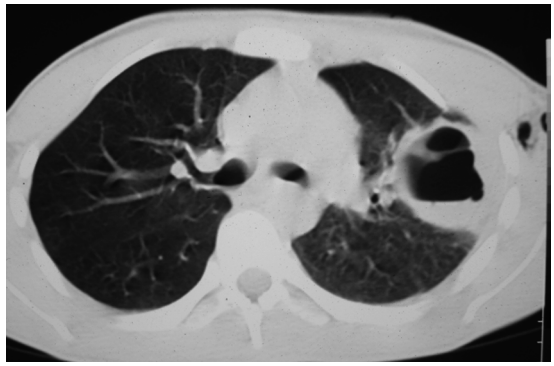

Fig. 4. Computed tomogram shows a post-traumatic pulmonary pseudocyst.

On hospital day 9 (antibiotics day 3), the patient became afebrile. Chest radiograph showed a cavitary lesion with an air/fluid level in the left lung (Fig. 3). CT revealed a post-traumatic pulmonary pseudocyst (Fig. 4). On hospital day 11 we removed the chest drain. The patient was discharged on the 20th hospital day, at which point chest radiograph still showed the pseudocyst, but without any fluid content. A month later, CT showed complete resolution of the pseudocyst (Fig. 5).

Discussion

Post-traumatic pulmonary pseudocyst is an uncommon cavitary lesion of the lung. These pseudocysts have no epithelial lining, and they usually develop after blunt chest trauma.[1] Pulmonary cavitary lesions can be caused by infectious diseases, congenital lesions, malignancies, and trauma. The incidence of post-traumatic pulmonary pseudocyst has been reported as 1–3% after blunt chest traumas in adults,[5] and more common in younger patients.

The pseudocyst develops via a mechanism that allows the transmission of high compressive force to the lung parenchyma.[6] Younger people have a more elastic and pliable chest wall, which permits greater transmission of kinetic energy to the lung parenchyma.[1-3,6] The rapid compression and decompression lacerates alveoli and interstitium, and the concomitant retraction of the surrounding elastic lung tissue leaves small cavities filled with air and/or fluid,[6] which tend to grow until a pressure balance is achieved between the cavity and the surrounding tissue.[5,6]

Fig. 5. Computed tomogram one month after trauma shows complete resolution of the post-traumatic pulmonary pseudocyst.

Another proposed mechanism is that if the glottis is closed or a bronchus is obstructed at the moment of injury, the air in the compressed lung segment fails to exit fast enough and the parenchyma and/or interstitium lacerates in a "bursting" pattern and forms a cavity.[6]

Post-traumatic pulmonary pseudocyst can be asymptomatic or associated with cough, chest pain, hemoptysis, dyspnea, and hypoxemia.[5] Our patient had substantial hemoptysis that resolved on the 4th day of intubation. Pseudocysts can be spherical or oval, large or small, and single or multiple.[5] In our patient the cavity was an approximately 8-cm oval, and had an air/fluid level.

Post-traumatic pulmonary pseudocysts may be identifiable on chest radiograph, but CT is superior for detecting them.[2] Unlike other cystic and cavitary lesions, the size, shape, and nature of the wall of a post-traumatic pulmonary pseudocyst change relatively quickly, so a series of chest radiographs over several days can help differentiate pseudocyst from other lesions.[7] In our patient, as in earlier reports, after the coexisting pulmonary contusion resolved, the post-traumatic pulmonary pseudocyst became clearer, and on repeated chest radiograph and CT there was a left-lung cavitary lesion on the 9th day.[1,2,5,7]

The transformation of a simple parenchymal laceration into a cavitary lesion or post-traumatic pulmonary pseudocyst might be related to mechanical ventilation.[5] Patients who require mechanical ventilation because of respiratory failure are placed on volume-controlled continuous mandatory ventilation to ensure adequate minute ventilation, and unless contraindicated, PEEP of 5 cm H_2O is applied. Once cardiopulmonary stability is achieved, partial ventilatory support is used, peak airway pressure is limited, and early extubation is the primary goal. Although Moore et al suggested using high airway pressure in these patients,[3] more recent studies argue against high pressure. Marino recommended lower pressure and PEEP adjusted according to sudden deterioration in cardiopulmonary status, such as hypotension, hypoxia, or respiratory distress.[8] Our patient was on volume-controlled continuous mandatory ventilation with plateau pressure < 30 cm H_2O and PEEP of 5 cm H_2O. Extubation was successful on hospital day 4.

Post-traumatic pulmonary pseudocysts usually resolve spontaneously, but they can be complicated and require surgery. The pseudocyst can rupture and cause a secondary pneumothorax that may require a thoracostomy tube.[5] Our patient underwent tube thoracostomy for associated hemopneumothorax. The indications for diagnostic and therapeutic bronchoscopy include endobronchial bleeding, thick sputum, large air leak, mediastinal emphysema, and lobar collapse.[1,3,5] Multiple bronchoscopies may be required.[2] With a simple pseudocyst, CT-guided aspiration may be the initial step for diagnosis.

The approach to an infected pseudocyst is similar to that for a lung abscess. If an infected pseudocyst is larger than 2 cm or there are unremitting signs of sepsis after 72 h of antibiotics, the pseudocyst should be percutaneously drained.[5] With complex post-traumatic pulmonary pseudocysts (extensive lung abscess surrounded by necrotic parenchyma, failure of bronchoscopic treatment of massive airway bleeding, infected pseudocyst > 6 cm, or no response to more conservative therapy), early lobectomy should be considered. The indications for video-assisted thoracoscopic surgery or open surgery include prolonged persistence of an air leak, hemothorax due to pseudocyst rupture, failure of lung expansion, progressive enlargement of the pseudocyst, and compression of functional parenchyma.[3,5] Late thoracotomy (lobectomy and cystotomy/capitonnage) has been reported up to 6 months after trauma because of pneumonic infiltration and persistent cavity size.[2]

The use of prophylactic antibiotics is not routine.[5] In one of the largest series, antibiotics were administered to all 12 cases, and there was complete resolution without complications.[7] Other researchers advised against prolonged antibiotic prophylaxis because of the risk of creating resistant organisms.[3] We believe early empirical antibiotic therapy is warranted by persistent fever, leukocytosis, radiographic modifications, or other signs of infection.[5] In a series of 8 patients, 5 patients with signs of sepsis or presumed pneumonia received empirical broad-spectrum antibiotics, and among those 5 patients, 2 resolved and 3 needed surgery.[3] In our patient, who had risk factors from trauma, tube thoracostomy, and intubation/ventilation, our diagnosis was hospital-acquired pneumonia. We administered a 7-day course of intravenous ceftazidime plus gentamycin, to which he responded well (afebrile within 72 h, and leukocyte count normal within 7 d). We also used bronchial hygiene and postural drainage to prevent a secondary infection. The resolution of the pseudocyst after one month was similar to that in earlier reports (resolution within 20 days to 6 months).[1-3,5]

Post-traumatic pulmonary pseudocyst is an uncommon cavitary lesion after blunt chest trauma. It is more common

in younger patients. It usually resolves spontaneously but may require surgery. CT is a more valuable than chest radiograph for early diagnosis. Prophylactic antibiotics may be indicated. Conservative management may be adequate, even for fluid-filled lesions. Clinicians should conduct follow-up radiographs or CTs until the pseudocyst resolves.

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