CASE REPORT

COCAINE INHALATION LEADING TO SPONTANEOUS PNEUMOMEDIASTINUM AND SUBCUTANEOUS EMPHYSEMA: A CASE REPORT AND REVIEW OF MECHANISMS

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Background: Spontaneous pneumomediastinum (SPM) and subcutaneous emphysema (SE) are rare clinical entities, typically resulting from trauma, invasive procedures, or underlying pulmonary pathology. However, recreational drug use particularly cocaine inhalation has emerged as a less common but important non-traumatic cause due to its barotrauma-inducing effects. **Case Presentation:** We present the case of an 18-year-old male with no known comorbidities who presented with progressive facial, neck, and chest swelling, pleuritic chest pain, and dyspnea. Physical examination revealed subcutaneous crepitus and altered voice resonance. Imaging via chest radiography and computed tomography (CT) confirmed extensive pneumomediastinum and subcutaneous emphysema. No pneumothorax or esophageal perforation was identified. A fluoroscopic contrast swallow excluded esophageal injury. Upon further evaluation, the patient admitted to recent inhalational cocaine use. He was managed conservatively with oxygen, analgesia, and clinical observation, resulting in full clinical and radiological resolution within two weeks. **Conclusion:** This case highlights the diagnostic challenge and clinical relevance of cocaine-induced SPM in young adults presenting with acute chest symptoms. It underscores the importance of a high index of suspicion, appropriate imaging, and the effectiveness of conservative management in stable patients. Increased awareness of this etiology is essential to avoid unnecessary interventions and support early identification. Further research is warranted to explore long-term outcomes and recurrence risk associated with drug-induced pulmonary barotrauma.

Keywords: Pneumomediastinum; Subcutaneous Emphysema; Cocaine; Barotrauma; Spontaneous; Conservative Management

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INTRODUCTION

Pneumomediastinum is defined as the presence of free air in the mediastinum, while subcutaneous emphysema refers to air trapped within the subcutaneous tissues, most often observed in the neck or chest wall. While both are uncommon findings, their spontaneous occurrence in young individuals, especially secondary to illicit drug use, remains underreported. Inhaled cocaine use is increasingly recognized as a cause of barotrauma due to increased intrathoracic pressure, leading to alveolar rupture and air dissection along the bronchovascular sheath into the mediastinum and soft tissues.[1,2] Early recognition and exclusion of life-threatening conditions such as esophageal perforation are critical.[3]

CASE PRESENTATION

An 18-year-old male presented to the Emergency Department with a three-day history of facial, neck, and chest swelling associated with pleuritic chest pain and mild shortness of breath. The patient denied any history of trauma or known recreational drug use at presentation. He had no significant medical or family history. On examination, vital signs were stable (HR 67 bpm, BP 125/80 mmHg, SpO_2 95% on room air). Tactile crepitus was noted in the supraclavicular region, with bilateral wheezing on auscultation. His voice was high-pitched and hyponasal, suggesting air tracking into the soft tissues of the upper airway. There were no clinical signs of airway compromise. Further imaging via CT Thorax (Figure 2) confirmed the presence of extensive subcutaneous emphysema in the neck and anterior chest wall, along with free gas in the superior mediastinum. Fluoroscopy using Omnipaque 300 contrast showing normal contrast progression without evidence of extravasation. The study ruled out esophageal perforation. There was no leak of contrast and no extravasation into the mediastinum during early or delayed imaging sequences. No pneumothorax or focal pulmonary lesion was identified. The findings were suggestive of spontaneous pneumomediastinum, potentially due to an airway leak, though no definitive site was identified.

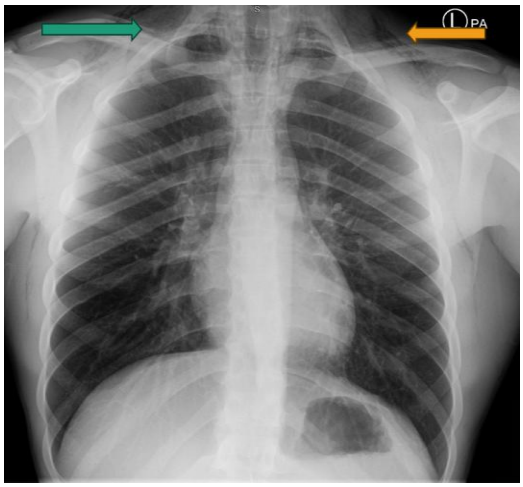

Figure-1: Chest X-ray (Initial Presentation).

Chest radiograph (PA view) showing radiolucent streaks of air in the cervical and thoracic subcutaneous tissues, consistent with extensive surgical emphysema and pneumomediastinum. This image demonstrates subcutaneous emphysema along the neck and chest wall and air outlining the mediastinum, confirming pneumomediastinum without associated pneumothorax

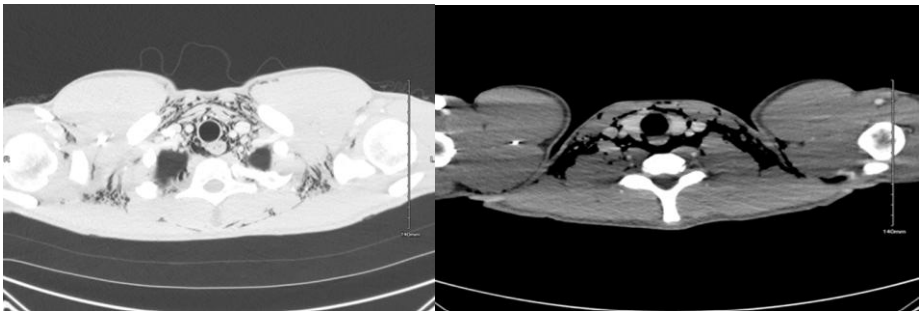

Figure 2: Fluoroscopic Swallow Study.

Figure A: Axial CT thorax image showing extensive subcutaneous emphysema in the neck and anterior chest wall, with free gas visible in the superior mediastinum, consistent with pneumomediastinum. No pneumothorax or focal pulmonary lesion is noted. Figure B: Axial CT thorax image (different window setting) demonstrating the same findings of subcutaneous emphysema and free mediastinal gas. There is no evidence of esophageal contrast extravasation or mediastinal fluid collection.

Fluoroscopic evaluation using Omnipaque contrast demonstrated normal esophageal contrast progression without evidence of leak or extravasation, effectively ruling out esophageal perforation. Both anteroposterior and lateral views confirmed intact esophageal integrity, and delayed imaging showed no contrast collection in the mediastinum (Figure 3A-3C). These findings supported the diagnosis of spontaneous pneumomediastinum, likely secondary to barotrauma from recent inhalational cocaine use, and justified the conservative management approach.

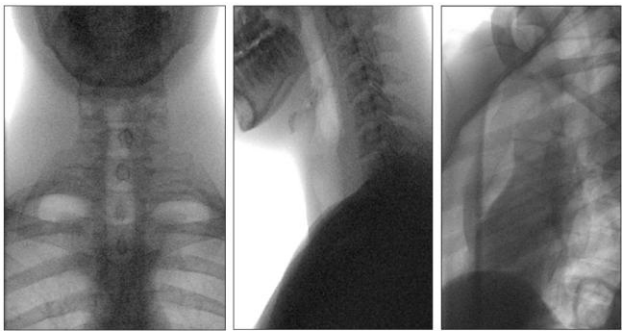

Figure-3: Fluoroscopic view.

Figure A. Anteroposterior fluoroscopic view showing normal contrast progression through the esophagus without evidence of extravasation. Figure B. Lateral fluoroscopic view further confirming normal contrast flow with no leak or collection in the mediastinum. Figure C. Delayed imaging sequence showing no contrast extravasation into the mediastinum, ruling out esophageal perforation.

Following a multidisciplinary review, the patient admitted to recent inhalational cocaine use, which likely contributed to alveolar rupture from barotrauma. Conservative management was adopted, including oxygen therapy, analgesia, and clinical observation.
The patient was monitored over 48 hours, during which his symptoms improved without complications. He was discharged with outpatient follow-up.

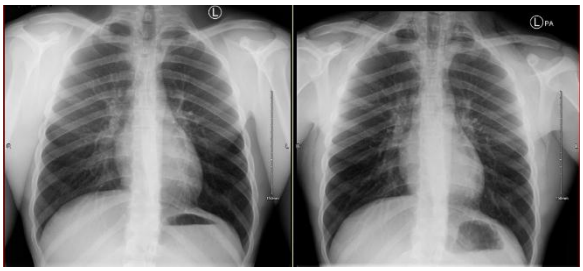

Figure-4: Follow-Up Chest X-ray (Two Weeks Post-Discharge).

Resolution of previous subcutaneous emphysema and pneumomediastinum on follow-up imaging. The radiograph confirms complete resolution of the previously observed emphysematous changes, validating the effectiveness of conservative management.

Therapeutic Intervention

The patient was managed conservatively with close inpatient monitoring, supplemental oxygen, and analgesia. Antibiotics were not initiated as there was no clinical or imaging evidence of infection or esophageal perforation. He was admitted to the medical ward with daily assessments and chest auscultation to monitor for progression. No surgical intervention was required.

Follow-Up and Outcome

At 48 hours, the patient's symptoms had improved markedly. He remained hemodynamically stable, with no signs of airway compromise. A follow-up chest X-ray after two weeks confirmed complete resolution of subcutaneous emphysema and pneumomediastinum. The patient was advised on the risks of recreational drug use and referred to outpatient addiction services.

DISCUSSION

SPM and SE, particularly in the absence of trauma, represent uncommon but clinically important entities. The classic triad of chest pain, dyspnea, and neck swelling first described by Hamman and later elaborated by Lintz[4] was observed in our patient, reinforcing the consistency of clinical features across case reports. However, the etiology in our case cocaine-induced barotrauma remains an infrequent and underdiagnosed cause.

In a comprehensive review by Kouritas *et al*.[1], most cases of pneumomediastinum were linked to iatrogenic or traumatic causes, with spontaneous cases being relatively rare and primarily occurring in young males. Our patient's demographics fit this profile, but his initial denial of drug use underscores the diagnostic challenge in cases with a concealed etiology. As Caceres *et al*.[2] highlighted, spontaneous cases must be meticulously evaluated to rule out life-threatening causes such as esophageal perforation or bronchial injury.

Our case mirrors the clinical natural history described by Panacek *et al*.[5], in which the majority of patients with SPM were stable and responded well to conservative treatment. This supports the growing consensus that invasive interventions are unnecessary in hemodynamically stable individuals without evidence of complications. In contrast, Kassem and Wallen[3] emphasized the potential risk of misdiagnosing Boerhaave syndrome, which can present similarly. The use of fluoroscopic contrast swallow in our case effectively ruled out esophageal injury, highlighting the importance of imaging in early work-up.

Drug-induced SPM is even more unusual and often underreported. Cocaine, a known vasoconstrictor, can induce alveolar rupture by increasing intrathoracic pressure during forceful inhalation or valsalva maneuvers.[6] Weissman[6] and Mégarbane *et al*.[7] provided detailed pathophysiologic mechanisms, showing how cocaine damages alveolar epithelium and disrupts the pulmonary interstitium, increasing susceptibility to rupture. Terra Filho *et al*.[8] added that repeated use of cocaine may lead to structural lung changes, predisposing to recurrent episodes.

Compared to previously reported cases, our case is distinct in the following ways. It occurred in an 18-year-old with no significant medical history, reinforcing that cocaine-induced barotrauma can be the first and only presentation. There was no pneumothorax or pneumopericardium, which are often associated features.[2,7] Diagnosis was complicated by initial concealment of drug use, making imaging and multidisciplinary evaluation critical. The patient fully recovered on conservative management, echoing the outcomes in most benign SPM cases.[5]

This case strengthens the body of evidence indicating that spontaneous pneumomediastinum in young, otherwise healthy individuals should raise suspicion for inhaled drug use even in the absence of initial admission and that non-invasive management is both safe and effective when serious pathology is excluded.

CONCLUSION

This case report presents a rare instance of cocaine-induced spontaneous pneumomediastinum and subcutaneous emphysema in a young male with no prior health issues. The diagnosis was supported by

imaging, and serious causes such as esophageal perforation. The patient improved with conservative treatment alone. Cocaine inhalation is a significant, often under-recognized cause of barotrauma. Spontaneous pneumomediastinum, while rare, typically has a benign course in stable patients. A high index of suspicion and thorough diagnostic evaluation are crucial, especially when the history is initially unclear.

Early identification and appropriate imaging are essential to avoid unnecessary interventions. Clinicians should routinely consider recreational drug use in differential diagnoses of young adults with acute chest symptoms, even when history is non-contributory. Furthermore, this case highlights the need for increased awareness and possibly routine toxicology screening in similar presentations. Research into the long-term pulmonary sequelae of cocaine use remains limited and warrants further study.

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