

# Unusual Presentation of Pneumopericardium, Pneumomediastinum, and Pneumothorax

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## ABSTRACT

A 26-year-old male with medical history of cocaine abuse complained of chest pain and dyspnea after having orthopedic surgery under spinal anesthesia. Physical exam demonstrated normal vital signs and subcutaneous emphysema in the neck. Chest X-ray revealed the presence of pneumomediastinum. Chest CT-scan confirmed the presence of pneumopericardium and subcutaneous emphysema. The patient managed conservatively was kept 48 hours in the intensive care unit. He was discharged after a repeated ameliorated chest X-ray.

Pneumopericardium, pneumomediastinum, and pneumothorax are rare conditions reported after cocaine use. A conservative approach is acceptable, as current literature suggests that this condition is usually self-limiting.

**Keywords:** pneumopericardium, pneumothorax, pneumomediastinum, cocaine abuse, spinal anesthesia.

## INTRODUCTION

Pneumopericardium is defined as the accumulation of air inside of the pericardial sac<sup>1</sup>. The incidence is relatively rare and not well defined as this condition is infrequently reported in the literature<sup>2</sup>. The most described etiologies are blunt trauma, fistula, infection and iatrogenic complications such as after esophagogastroduodenoscopy or pacemaker insertion<sup>3</sup>. Few cases of pneumopericardium were reported in patients who abuse cocaine<sup>4,5</sup>.

## CASE REPORT

A 26 year old male with patellar instability presented for medialization tibial osteotomy. He is 195 cm tall and weighs 85 kg. His medical history included smoking,

alcohol use, cocaine abuse and a surgical history of patellar fracture two years ago done under spinal anesthesia. Preoperative complete blood count and hemostasis studies were all within normal range. Preoperative chest X-ray was not performed according to the institution protocols. A physical examination was unremarkable and an anesthetic plan was developed for spinal anesthesia with monitored anesthesia care.

In the operating room, with the patient seated upright, a 25-gauge spinal needle was used to give spinal anesthesia with 2.2 mL of 0.5% hyperbaric bupivacaine and 2,5 µg of sufentanil into the intrathecal space at the L4–L5 level using a midline approach. Bilateral sensory blockade to the T6 level was confirmed. Perioperative monitoring included EKG, SpO<sub>2</sub> and NIBP. Vital signs

were recorded during surgery in the operating room and in the post anesthesia care unit and were normal.

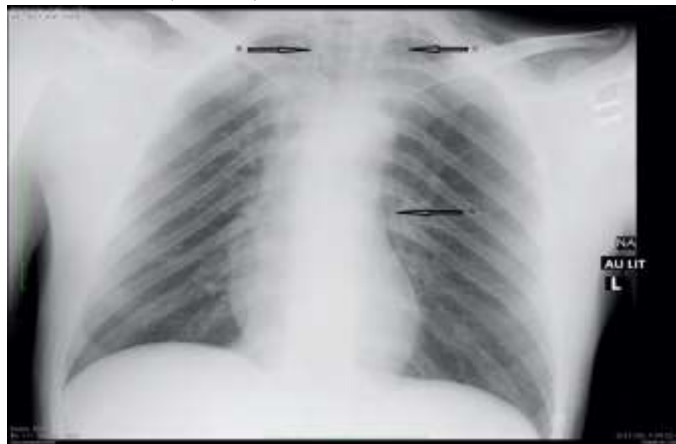
Twenty three hours postoperatively, on the floor, the patient complained of dyspnea and chest pain. The physical exam showed respiratory rate 22/min, tachycardia 102/min, SpO2 97% (under 3 liters of O2 through nasal cannula), blood pressure 120/80 mmHg and presence of crepitus on palpation of the anterior neck. There was no murmur, crackles or cardiac crunch on chest auscultation. Blood gases were within normal range.

The chest X-ray revealed linear detachment along the silhouette of left ventricle and left atrium, presence of pneumomediastinum, and subcutaneous emphysema in the cervical area (Figure 1). The Chest CT-scan

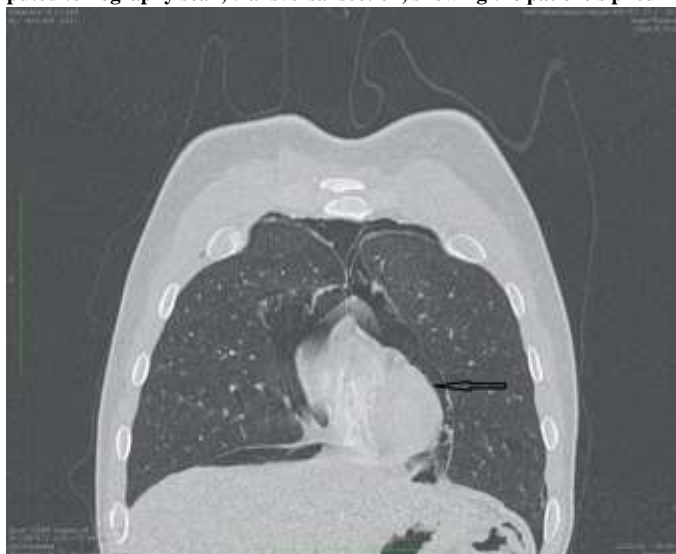
revealed the presence of pneumopericardium (Figure 2), pneumomediastinum, bilateral apical pneumothorax and emphysema around the neck area, trachea, and peri-oesophagus (Figure 3). The Patient was transferred to the ICU for continuous monitoring. The treatment was conservative with supplemental nasal 3 liters O2. The vital signs remained within normal range throughout the duration of the hospitalization. The patient was discharged after 48 hours when he tolerated a regular diet and was able to ambulate without respiratory distress with an ameliorated chest X-ray.

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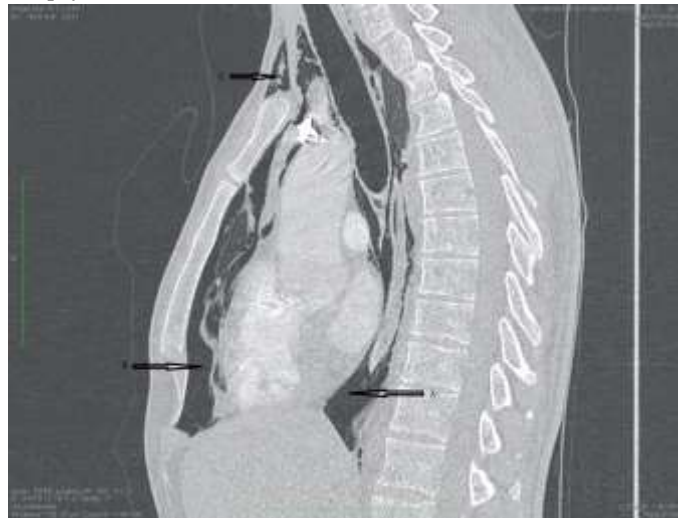
**Figure 1:** Anteroposterior chest radiograph showing pneumopericardium (Arrow A), pneumomediastinum (Arrow B), and subcutaneous emphysema in the cervical area (Arrow C).



**Figure 2:** Chest computed tomography scan, transversal section, showing the patient's pneumoerocardium (Arrow).



**Figure 3:** Computed tomography scan, sagittal section, showing the patient's pneumopericardium (Arrow A), pneumomediastinum (Arrow B), and subcutaneous emphysema in the cervical area (Arrow C).



## DISCUSSION

Pneumopericardium develop whenever a communication is made between the pericardial sac and an air-containing organ<sup>1,6,7</sup>. Pneumopericardium, as a complication of cocaine abuse, is extremely rare with only few cases found in the literature<sup>4,5</sup>.

It is unclear whether the pathophysiology of pneumopericardium is by pulmonary barotrauma or microscopic tracheal/esophageal tear. The Macklin effect, pulmonary barotrauma, is due to alveolar rupture by an abrupt increase in intra-alveolar pressure leading to air dissection along broncho-vascular sheaths with eventual spread to the pulmonary interstitium and the mediastinal and pericardial cavities. This is thought to be the result of either a sudden increase in intrathoracic pressure due to rapid nasal inhalation, coughing, sneezing, and vomiting or a Valsalva's maneuver. Whereas microscopic tracheal/esophageal tear is due to the solid contaminants in the crystalline mass inhaled or snorted by the patient<sup>4,5</sup>.

In the published literature, the majority of the patients presenting with spontaneous pneumopericardium and/or pneumomediastinum are young thin males without previous medical history, much like this patient. The most frequent complaint

described is chest pain followed by neck pain, dyspnea<sup>1,6,7</sup>.

On auscultation, muffled heart sounds are usually heard in fluid-induced cardiac tamponade. However, in the case of pneumopericardium having air between the heart and the pericardial sac, a crunching sound synchronous with the heartbeat is usually heard, the Hamman's sign<sup>6-8</sup>.

Diagnosis of spontaneous pneumopericardium can often be made with a formal Chest X-ray. The "halo" sign, a continuous rim of air outlined by a radiopaque line representing the pericardial sac, is the pathognomonic finding. Chest Computed Tomography scan, the gold standard for thoracic radiological investigations, is helpful to exclude secondary causes of pneumopericardium<sup>8</sup>. Both findings were present in our case.

Spontaneous pneumopericardium is generally a benign and self-limiting process which responds well to conservative treatment consisting of bed rest, oxygen therapy, and analgesia. The mechanism of treatment by high-flow concentrated oxygen is explained by the capacity of oxygen to alter the diffusion dynamics of the nitrogen component in room air, and it has been demonstrated to decrease the time of resolution from pneumothorax, pneumomediastinum and pneumopericardium<sup>8</sup>.

Our patient's presentation included subcutaneous emphysema, pneumomediastinum, and pneumopericardium. Some authors consider associated subcutaneous emphysema a good prognostic factor, as air escaping from the mediastinum will decrease the risk of tension pneumopericardium<sup>8</sup>.

## CONCLUSION

In conclusion, we advocate that pneumopericardium, pneumomediastinum, and pneumothorax should be considered in the differential diagnosis of atraumatic chest pain in the postoperative period in young adults addicted to cocaine. Chest X-ray is the key for diagnosis and the treatment is conservative. Although the pathophysiology is not well identified, the prognosis is usually excellent.

### *Declaration by Authors*

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**Conflict of Interest:** The authors declare no conflict of interest.

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