

## CASE REPORT

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# Spontaneous Pneumomediastinum in a Teenager After Physical Exercise: a Benign and Rare, but Sometimes Challenging, Entity

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## ABSTRACT

**Introduction:** Pneumomediastinum defines a condition in which free air is present in the mediastinum usually caused by alveolar rupture resulting from a sudden increase in the intrathoracic pressure and air tracking along the tracheobronchial tree. **Case report:** We present a case of a 16-year-old male patient referred to our department due to persisting odynophagia, and retrosternal chest pain. A performed chest-CT revealed presence of free air in the mediastinum, without evidence of pneumothorax, or subcutaneous emphysema. Under the diagnosis of spontaneous pneumomediastinum (SPM) the treatment included conservative therapy with analgesics, rest, and oxygen. **Conclusion:** SPM is a rare benign condition with nonspecific presenting clinical signs; thus its diagnosis remains mostly one of exclusion. Thorough history-taking, beside radiographic studies, may be the key to confirm the diagnosis.

**Keywords:** Pneumomediastinum, chest-CT, physical exercise.

## 1. INTRODUCTION

Pneumomediastinum defines a condition in which free air is present in the mediastinum. According to the pathological cause, it is further divided into two entities: the spontaneous (SPM) with no underlying diseases or precipitating factors, and the secondary pneumomediastinum caused either by rupture of the aerodigestive tract due to trauma, surgery, as well other interventions, or by gas-forming mediastinal infections (1).

## 2. CASE PRESENTATION

A 16-year-old male patient referred to our department by his general practitioner. The patient initially complained of odynophagia, and retrosternal chest pain since two days. He was nonsmoker and reported of a blunt thoracic trauma with sternal fracture six weeks before admission. On physical examination there were no pathological findings like dys- or tachypnea, subcutaneous emphysema, lymphadenopathy, and abnormal throat-examination or lung-auscultation. Laboratory evaluation revealed normal values with a WBC being within normal range. An initially performed posteroanterior radiography of the chest was read as normal (Figure 1).

The general practitioner subsequently initiated, due to the symptoms' progression and persistence as well the former thoracic injury, a chest-CT, which revealed presence of free air in the mediastinum (red arrows), without evidence of pneumothorax, or subcutaneous emphysema (Figure 2).

Noteworthy, the patient reported, after explicit history-taking, of having intense physical activity involving Valsalva maneuver (chin-ups) 3-4 hours before the symptoms appeared. His treatment included conservative therapy with analgesics, rest, and oxygen. Within three days of hospitalization the symptoms declined and he was discharged from the hospital without complications, while his clinical condition was unremarkable in the performed follow-up examination ten days after.

## 3. DISCUSSION

Pneumomediastinum defines a condition in which free air is present in the mediastinum. According to the pathological cause, it is further divided into two entities: the spontaneous (SPM) with no underlying diseases or precip-

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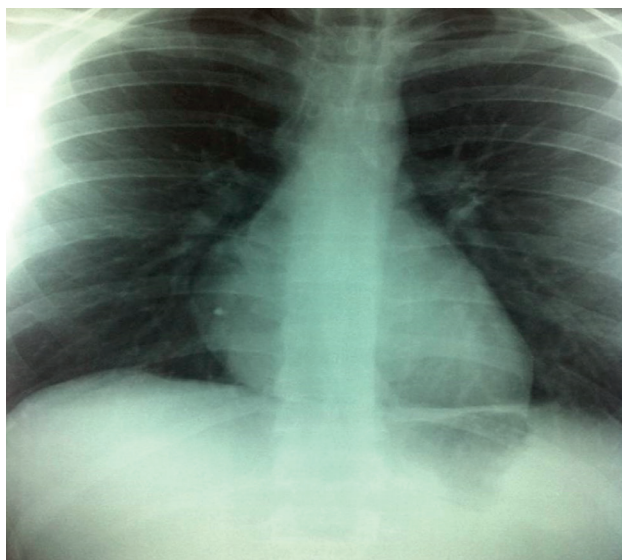


Figure 1. Posteroanterior radiograph of the chest at admission.

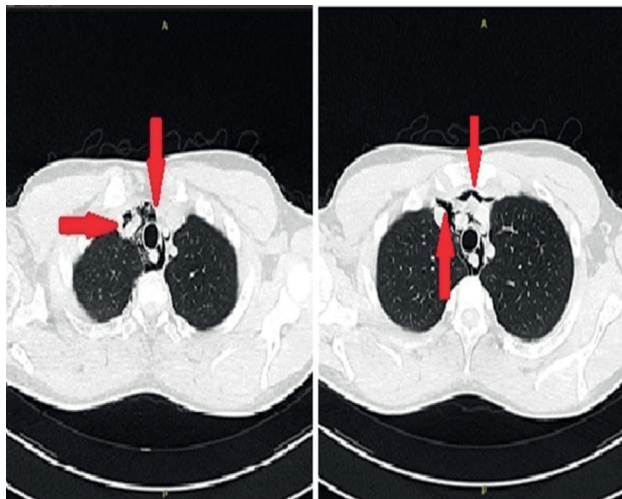


Figure 2. Computed tomography of the chest indicating pneumomediastinum (red arrows)

itating factors, and the secondary pneumomediastinum caused either by rupture of the aerodigestive tract due to trauma, surgery, as well other interventions, or by gas-forming mediastinal infections (1).

Spontaneous pneumomediastinum (SPM) or Hamman's syndrome was first reported in 1939 by Louis Hamman and the reported incidence ranges from 1 per 7,000-30,000 hospital admissions (2). Nevertheless, its true incidence may be underestimated, as it often presents, like in the presented case, with nonspecific symptoms and image findings that can be easily missed. Historically Macklin was the first to describe the pathogenesis of the onset. Accordingly the condition arises from alveolar rupture with further leakage of air throughout the interstitium, caused by a sudden increase in intrathoracic pressure (3). SPM occurs predominantly in young male adults (male/female ratio of 8:1) (4).

In ambulatory patients, SPM may be secondary to asthma, inhalation drug use, labor, coughing, forceful straining during exercise, or other activities associated with a Valsalva maneuver like in our case. In general athletic action has been reported to cause pneumomedi-

astinum (5). The most common complaints are in approximately 80% of SPM-cases dyspnea and pain. The pain is usually substernal and aggravated by movement, breathing, and position changes. Other common symptoms include localized symptoms such as neck pain, dysphagia (like in the presented case), and dysphonia (6). Probably due to the patients' good physical condition and because an athlete may not associate symptoms with a specific traumatic event during sports usually there is a delay in presentation to the emergency department (5). Although it represents a rare benign condition, it should be differentiated to the secondary pneumomediastinum, an ominous entity with potentially catastrophic complications. In general the presence of free air in the mediastinum is a finding, which may raise the concern for potential devastating conditions like abscess formation or esophageal perforation, with subsequent mediastinitis. Because of the nonspecific SPM's presenting clinical signs, its diagnosis remains mostly one of exclusion. The most important diagnostic tool to confirm SPM is radiography. According to the published data, the diagnosis of SPM is usually established with a clinical examination and a simple chest X-ray. As far as 50% of all cases might remain undiagnosed if only a posteroanterior chest x-ray is taken, a lateral view is recommended to identify the presence of air (7). However, if the diagnosis of SPM is still unclear, or if there is a suspicion of secondary pneumomediastinum, a CT scan should be added to ensure the diagnosis (8). A thorough explicit history-taking, beside radiographic studies, plays also a substantial role in confirming the diagnosis.

Conservative management including rest, analgesia, and close observation is the mainstay of treatment in SPM. The clinical time course in which the symptoms improve range from 24-48 hours and the complete x-ray resolution generally takes about a week (9). Long time follow-up is not recommended due to the facts that: complications associated with SPM rarely occur, the recurrence-incidence is low, and the entity is characterized by a spontaneous recovery (10). Subsequently we did not performed a follow-up CT-scan in the presented case, because of the patient's unremarkable clinical condition.

#### 4. CONCLUSION

Spontaneous pneumomediastinum is an uncommon, benign and self-limiting condition that often presents with chest pain, dyspnea and/or subcutaneous emphysema. It can develop without a triggering event. Diagnosis requires a high level of suspicion as lot of cases present without any precipitating factor, or can be missed by a plain chest radiograph. Thus computed tomography of the chest remains the gold standard in establishing the diagnosis. Additionally the role of thorough explicit history-taking in order to confirm the diagnosis should not be underestimated.

Clinical outcomes of SPM are excellent, while the recurrence rate is low. Nevertheless secondary causes of mediastinal air must be ruled out, because secondary

pneumomediastinum may have a devastating outcome if not diagnosed promptly.

- **Declaration of patient consent:** Authors certify that they have obtained patient consent form.
- **Author's contribution:** All authors equally participated in preparing this case report presentation. Final proof reading made by the first author.
- **Conflict of Interests:** The authors declare that there is no conflict of interests.
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