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# Cannabis-associated spontaneous pneumomediastinum in a young adult: A case report

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## Abstract

Spontaneous pneumomediastinum (SPM) is a rare condition characterized by the leakage of air into the mediastinum without trauma, surgery, or iatrogenic causes. In this case, a 25-year-old male patient with no systemic disease presented with sudden onset of dyspnea and neck pain while skiing. Physical examination revealed subcutaneous emphysema, and thoracic computed tomography (CT) demonstrated mediastinal air collection, leading to the diagnosis of SPM. The patient was managed conservatively with oxygen and analgesic therapy, and his clinical condition remained stable. The medical history revealed that the patient was a chronic cannabis user and had consumed cannabis prior to the onset of symptoms. Based on these findings, the case was evaluated as cannabis-induced SPM. Cannabis use may increase intrathoracic pressure and cause alveolar rupture via the Macklin effect. Management of SPM is generally conservative; however, it is important to exclude serious underlying causes. This case highlights cannabis use as a potential risk factor for SPM and emphasizes the need to carefully assess it during differential diagnosis.

**Keywords:** pneumomediastinum, cannabis use, substance-related disorders, young adult

### Main points

- Spontaneous pneumomediastinum (SPM) is a rare but generally benign clinical condition that can occur in young and healthy individuals. Sudden-onset chest pain, dyspnea, and subcutaneous emphysema are the typical findings.
- The Macklin effect is the most widely accepted pathophysiological mechanism of SPM. Increased intrathoracic pressure leads to alveolar rupture, and the released air progresses through the interstitial tissues to the mediastinum. This process can be triggered by coughing, vomiting, Valsalva maneuvers, and particularly heavy cannabis inhalation.
- Cannabis use is an important risk factor for SPM. Deep inhalation, breath-holding, and vomiting increase intrathoracic pressure and may cause the development of SPM. Therefore, a detailed history of substance use should always be obtained in young patients.
- The management of SPM is mostly conservative. Oxygen therapy, analgesia, and close clinical observation are usually sufficient. However, serious conditions such as pneumothorax, esophageal rupture (Boerhaave's syndrome), and tracheobronchial injury must be excluded in the differential diagnosis.

## Introduction

SPM is a rare clinical condition characterized by the leakage of air into the mediastinum without an underlying traumatic, surgical, or iatrogenic cause. It typically occurs in young and otherwise healthy individuals and presents with symptoms such as sudden-onset retrosternal chest pain, dyspnea, and subcutaneous emphysema. Although the clinical findings are often characteristic, careful differential diagnosis is required to exclude more serious pathologies with similar presentations. The diagnosis is usually established through radiological imaging methods, and the condition generally follows a benign course (Weiss et al., 2019).

The most widely accepted pathophysiological mechanism of SPM is the process described in the literature as the Macklin effect. In this mechanism, a sudden and significant increase in intrathoracic pressure leads to alveolar rupture. The released air then dissects through the interstitial tissue along the bronchovascular sheaths and progresses toward the mediastinal space. This process is typically triggered by situations such as Valsalva-like maneuvers, severe coughing

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episodes, vomiting, or intense respiratory effort, and it plays a fundamental role in the development of SPM (Horugsa et al., 2024).

In recent years, Cannabis inhalation has been reported as a possible precipitating factor for SPM. Particularly, the intense inhalation of cannabis increases intrathoracic pressure through techniques such as the Müller maneuver and the Valsalva maneuver, which may subsequently lead to alveolar rupture. In addition, severe vomiting episodes associated with cannabis use can also trigger the Macklin effect and result in SPM. Reports of cannabis-related SPM cases have been increasing in the literature, highlighting the importance for physicians to consider this possibility, especially in young male patients (Ahmad et al., 2023).

In this case report, we present a young male patient who developed spontaneous pneumomediastinum following chronic cannabis use. The aim of this report is to highlight the role of cannabis use in the development of SPM and to emphasize the importance of considering this factor in the differential diagnosis of young patients presenting with sudden chest pain and dyspnea. In this way, unnecessary investigations may be avoided, and appropriate clinical management can be ensured.

## Case Report

A 25-year-old male patient with no known systemic disease presented to the emergency department with sudden-onset dyspnea and neck pain while skiing. On physical examination, subcutaneous crepitation suggestive of subcutaneous emphysema was detected. Chest radiography (Figure 1) revealed mediastinal and subcutaneous air images, leading to a preliminary diagnosis of pneumomediastinum, and thoracic CT was subsequently performed. CT imaging demonstrated extensive free air collections along the mediastinum (Figure 2). Based on these findings, the patient was admitted to the ward for clinical observation and conservative management. Oral intake was discontinued, and symptomatic treatment including analgesics and oxygen supplementation was initiated. Laboratory investigations revealed no significant pathological findings. During follow-up, a detailed medical history revealed that the patient was a chronic cannabis user and had consumed cannabis a few hours prior to the onset of symptoms. He stated that he used cannabis approximately 2-3 times a week, both by smoking and vaping using electronic devices. In light of this information, the clinical picture was evaluated as SPM secondary to chronic cannabis use. Throughout the three-day hospital stay, the patient's vital signs remained stable, and his symptoms regressed. Control radiographs showed no increase in mediastinal or subcutaneous air. Once oral intake was tolerated, the patient was discharged. The patient was informed that there was a risk of recurrence if cannabis use continued after discharge and that he should attend the hospital for periodic check-ups. At outpatient follow-up visits, no symptoms or radiological abnormalities were detected. All necessary consent was obtained from the patient for the academic use of his information in this article.

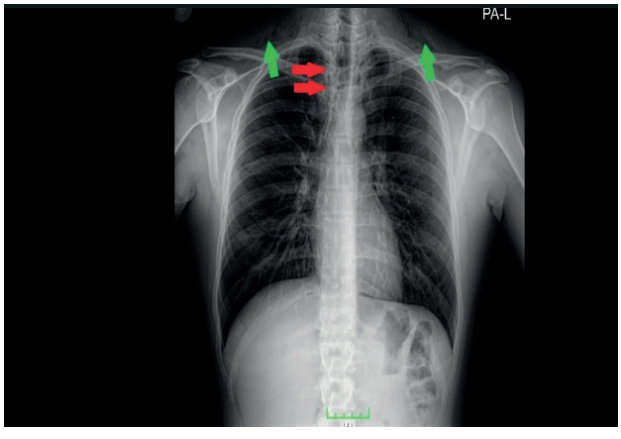


**Figure 1.** On the posteroanterior chest radiograph, subcutaneous emphysema is visible at the tips of the green arrows and pneumomediastinum at the tips of the red arrows.

**Figure 2.** Axial chest CT showing pneumomediastinum along the mediastinal structures (green arrows).

## Discussion

SPM is a rare clinical condition characterized by the accumulation of air in the mediastinum without trauma, invasive procedures, or underlying lung disease. Most cases occur in young, healthy male individuals, and clinical symptoms often present with sudden-onset retrosternal chest pain, dyspnea, and subcutaneous emphysema (Cicak et al., 2009).

These demographic characteristics are consistent with the patient presented in our case.

Cannabis use has increasingly been reported in recent years as a risk factor for SPM. The exact mechanism of pneumomediastinum secondary to marijuana use is unclear, but it is postulated that cannabis smoking may cause a sudden increase in intra-alveolar pressure, leading to alveolar trauma and subsequent air leakage into the mediastinum. This phenomenon is called the Macklin effect and may occur following via inspiration against a closed airway (Müller's maneuver) after forced exhalation or exhalation against a closed glottis or airway (Valsalva maneuver). Both of these maneuvers are common in marijuana users. In particular, intense inhalation, breath-holding, and forceful expiratory maneuvers can cause sudden increases in intrathoracic pressure, thereby triggering the Macklin effect. In addition, severe vomiting episodes associated with cannabis use, such as those seen in cannabinoid hyperemesis syndrome, may also lead to alveolar rupture through a similar mechanism. In the present case, cannabis use was reported prior to the event, and it was considered to have played a direct role in the onset of symptoms (Weiss et al., 2019).

In the differential diagnosis, serious clinical conditions such as spontaneous pneumothorax, esophageal rupture (Boerhaave's syndrome), tracheobronchial injuries, pericardial diseases, and acute coronary syndrome should be excluded. In particular, the presence of vomiting, chest pain, and subcutaneous emphysema in the patient's history should raise suspicion for Boerhaave's syndrome, and advanced imaging methods such as esophagography should be considered when necessary. However, as in most cases of SPM, invasive diagnostic procedures were not required in our patient due to the absence of systemic findings and the stable course of vital parameters (Wald et al., 2024).

The management approach in spontaneous SPM is generally conservative. In the absence of findings suggestive of an underlying serious pathology, oxygen therapy, symptomatic relief with appropriate analgesics, and careful clinical observation are sufficient for most patients. Oxygen therapy is thought to accelerate the resorption of free mediastinal air. The majority of patients with a stable clinical course and normal vital signs can be followed on an outpatient basis without hospitalization. However, in the early stages of diagnosis, short-term hospitalization and observation are recommended to exclude life-threatening alternative diagnoses such as esophageal rupture or tracheobronchial injury. This approach contributes both to avoiding unnecessary invasive procedures and to ensuring patient safety (Magouliotis et al., 2023). In our case, following three days of conservative treatment and clinical observation, the patient's symptoms regressed, and no complications developed during follow-up.

Another important point to emphasize is that a history of cannabis use is often not spontaneously disclosed by patients at presentation. Therefore, in cases of non-traumatic pneumomediastinum, a detailed and reliable assessment of substance use history should be conducted. Otherwise, the etiological cause may be overlooked, and unnecessary diagnostic tests may be performed.

## Conclusion

Cannabis-induced spontaneous pneumomediastinum, although rare, is being reported with increasing frequency and generally follows a benign clinical course. In young, otherwise healthy individuals presenting with sudden chest pain and subcutaneous emphysema, a detailed history of substance use plays a critical role in establishing the diagnosis. While conservative management is often sufficient in such cases, timely and accurate diagnosis is essential to prevent unnecessary invasive procedures and the overuse of hospital resources.

## Author contributions

Conception: H.E.C.; Design: H.E.Y., R.Y.; Data acquisition: H.E.C.; Data analysis: H.E.Y., S.E.A.; Data interpretation: R.Y.; Drafting of the manuscript: H.E.Y., R.Y.; Critical revision of the manuscript: H.E.Y., H.E.C., S.E.A. All authors reviewed the results, approved the final version of the manuscript, and agreed to be accountable for all aspects of this study.

## Ethical approval

Written informed consent was obtained from the patient for publication of the clinical details and accompanying images.

## Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

## Conflict of interest

The authors declare that this study was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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## Generative AI statement

The authors declare that during the preparation of this study, the following AI-assisted technology was used: ChatGPT-4 (OpenAI, 2024) on 2024. Extent of Use: Used exclusively for grammar correction and enhancing clarity. The authors confirm that they have critically reviewed and edited any AI-generated content and take full responsibility for the integrity,

accuracy, and originality of the publication. The authors certify that the original human contribution is maintained and that AI-assisted tools are not listed or cited as authors.

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