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Abel Enrique Manjarres Guevara
Department of Medicine and Health Sciences, Universidad del Norte, Barranquilla, Colombia

Andrea Carolina Castillo Barbosa
Department of General Surgery, Universidad del Rosario, Bogotá, Colombia

Paola Andrea Cifuentes Grillo
Department of General Surgery – Hospital Occidente de Kennedy, Bogotá, Colombia

Diego Alejandro Piñeros Nieto
Department of Radiology, Universidad del Rosario, Bogotá, Colombia

Iván Alfredo De Ávila Consuegra
Department of Internal Medicine, Universidad Libre, Barranquilla, Colombia

Corresponding Author:
Abel Enrique Manjarres Guevara
Department of Medicine and Health Sciences, Universidad del Norte, Barranquilla, Colombia

Delving deeper: Understanding spontaneous pneumomediastinum as an atypical cause of chest pain in young patients

Abel Enrique Manjarres Guevara, Andrea Carolina Castillo Barbosa, Paola Andrea Cifuentes Grillo, Diego Alejandro Piñeros Nieto and Iván Alfredo De Ávila Consuegra

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Abstract

Pneumomediastinum denotes the presence of air within the mediastinum, with causative factors including trauma or conditions facilitating air intrusion into this region. It is divided into primary (spontaneous) or secondary types, contingent upon the presence or absence of a discernible etiology. Primary pneumomediastinum warrants consideration in the diagnostic framework for chest pain, particularly when accompanied by supplementary symptoms. Inquiry into potential triggers, including psychoactive substance use, is imperative, alongside ensuring comprehensive rest and outpatient monitoring for complete recuperation. Despite its infrequency, its occurrence in young adults, particularly males, is notable. Pathophysiological mechanisms entail alveolar rupture and the Macklin effect. This report presents two instances of pneumomediastinum: one in a hitherto healthy athlete and the other in a young cannabis user. Both manifested chest pain alongside additional symptoms and clinical indicators such as dysphagia and subcutaneous emphysema.

Keywords: Pneumomediastinum, Hamman sign, marijuana, chest pain, cannabis, young patients

Introduction

The mediastinum, a central intrathoracic extrapleural compartment situated between the lungs; bounded by the sternum, costochondral junctions, vertebral bodies, and ribs ^[1], serves as a pivotal anatomical region. Pneumomediastinum, characterized by the presence of air within this space, was initially delineated by Laënnec in 1819 ^[2]. This condition may arise secondarily to physical trauma or other circumstances prompting air leakage from the lungs, airways, or gastrointestinal tract into the thoracic cavity ^[3]. The disseminated air may subsequently extend to adjacent cervical subcutaneous tissues, the epidural space, the pericardium, and/or the peritoneal cavity through contiguous pathways ^[4].

Pneumomediastinum can be categorized as primary (Also known as spontaneous) or secondary ^[3, 4]. Secondary pneumomediastinum occurs when an underlying cause can be identified (Such as respiratory diseases, childbirth, trauma, among others) ^[3], whereas spontaneous or primary pneumomediastinum is one that arises without any apparent trauma or other identifiable alteration or procedure ^[3, 5]. It predominantly affects young adults, with a male-to-female ratio of 8:1 ^[6]. It is a rare, self-limiting condition, typically managed expectantly ^[5]. Its incidence is estimated to be 1 in 30,000 cases in emergency services ^[6, 7]. The pathophysiology of this uncommon phenomenon is elucidated by the Macklin effect, wherein alveolar rupture leads to air leakage through the bronchovascular sheath, resulting in the accumulation of intramediastinal air ^[7].

Numerous antecedent events frequently precede spontaneous pneumomediastinum, with forceful vomiting episodes (36%) and asthma exacerbations (21%) emerging as primary contributors. Nevertheless, in 21% of instances, identifying a specific triggering event proves elusive ^[8]. Noteworthy among other immediate antecedents and risk factors are severe bouts of coughing, strenuous physical exertion, vigorous vocalization, engagement in wind instrument playing, spirometry maneuvers, presence of airway foreign bodies leading to air entrapment, as well as the consumption of tobacco or recreational drugs such as cocaine, ecstasy, methamphetamines, and marijuana ^[3, 4, 8, 9]. This article presents the cases of two young patients who presented with chest pain at the emergency department, underscoring the

imperative of considering this diagnosis in such clinical presentations and the significance of recognizing, elucidating, and investigating potential associated risk factors.

Case presentation

Case 1

A 26-year-old male, with no pertinent medical or surgical history, actively involved in high-intensity sports, presented with an acute onset of chest and neck pain lasting 1.5 hours. The pain was described as oppressive, exacerbated by movements and deep inspiration. He denied any episodes of vomiting, trauma, Valsalva maneuvers, or ingestion of foreign bodies. Upon admission, he exhibited hemodynamic stability, absence of tachycardia, and maintained oxygen saturation levels. Physical examination revealed notable subcutaneous emphysema and elicited a positive Hamman sign. Chest X-ray revealed pneumomediastinum, which was subsequently confirmed by contrast-enhanced chest CT. An esophagogram with water-soluble contrast demonstrated an intact esophagus without evidence of contrast extravasation. Transthoracic echocardiogram findings were within normal limits. Hospitalization was deemed necessary, and the patient was managed with supplemental oxygen therapy and close observation. He was discharged after 24 hours with resolution of presenting symptoms.



Fig 1: Chest X-ray. Linear radiolucent images extending towards the lower left cervical region are observed, with radiolucent images in the paratracheal bands and around the left cardiac contour in the territory of the pulmonary artery, consistent with pneumomediastinum and pneumopericardium.

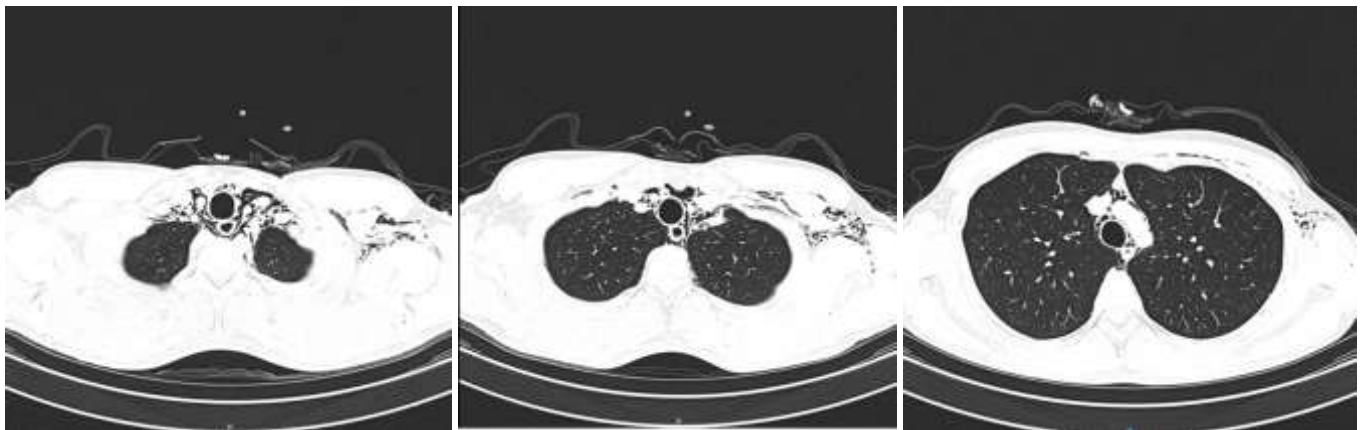


Fig 2: Chest CT. Chest CT scan reveals emphysema in both pectoral regions, predominantly on the left, extending towards the axillary region. Associated with this finding is the presence of gas in the mediastinum, distributed concentrically around the vascular structures, the trachea, and the esophagus. No parenchymal lesions are observed

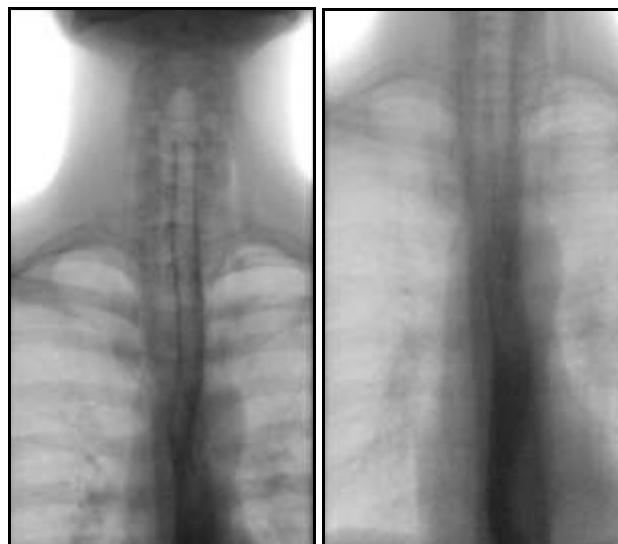


Fig 3: Esophagogram. Esophagogram within normal limits

Case 2

A 20-year-old male, with no underlying health conditions but a history of smoking and frequent marijuana use since the age of 16, presented to the emergency department complaining of retrosternal oppressive pain persisting for 2 days, accompanied by vomiting episodes and dysphagia. Upon admission, he exhibited tachycardia, with physical examination revealing cervical subcutaneous emphysema. Hospitalization was promptly initiated to facilitate comprehensive diagnostic imaging, consideration of differential diagnoses, laboratory assessments; and initial therapeutic interventions including oxygen supplementation, intravenous fluids, and analgesics. While the chest X-ray appeared normal, computed tomography (CT) imaging unveiled pneumomediastinum extending into the deep soft tissues of the neck and axillary regions, alongside leukocytosis and neutrophilia. Considering a possible differential diagnosis of Boerhaave syndrome, antibiotic therapy was promptly initiated, although upper gastrointestinal endoscopy yielded negative findings for esophageal perforation. During the hospital stay, the patient experienced sudden anxiety and recurrent vomiting episodes, disclosing an attempt to cease marijuana use three days before symptom onset, followed by relapse the day prior. Psychiatric evaluation corroborated a diagnosis of withdrawal syndrome, prompting tailored management. By the fifth day of hospitalization, the patient reported complete resolution of symptoms, with no evidence of subcutaneous emphysema on examination and absence of pneumomediastinum on subsequent chest X-ray. He was discharged with instructions for vigilant monitoring under the purview of general surgery and outpatient laboratory assessments.

Discussion

Among patients with spontaneous pneumomediastinum, chest pain emerges as the most reported symptom, evident in 75% of cases [2, 3]. Furthermore, dyspnea (49%), posterior neck pain (36%), cough (36%), dysphagia (18%) [2], as well as sore throat and abdominal pain (10%), may manifest concurrently. Notably, subcutaneous emphysema represents the prevailing clinical sign during physical examination, observed in approximately 58% of patients [2]. Additional clinical manifestations such as rhinolalia, tachycardia, tachypnea, hoarseness, and cervical edema [2, 3] may also be encountered. While the Hamman sign, characterized by a crunching or crackling sound synchronized with cardiac sounds heard over the apex of the heart, is diagnostically specific, its occurrence is relatively rare, documented in only about 18% of cases [2-4].

Diagnosis is established in 90% of cases through chest X-ray, where specific indicators of the condition, such as the ring sign or thymic sail sign (predominant in pediatric cases), may be discerned [2, 4].

In many instances, distinguishing between pneumomediastinum and pneumopericardium presents a diagnostic dilemma, warranting the utilization of chest computed tomography (CT) [3]. CT imaging is particularly recommended in cases where diagnostic uncertainty persists following initial chest X-ray evaluation; however, some experts advocate for CT scanning in all patients due to the potential for concurrent critical events necessitating surgical intervention [9]. Moreover, contrast-enhanced CT of the neck

and chest has demonstrated efficacy in diagnosing tracheal injury in 70% of cases [5]. In emergent scenarios, ultrasound may serve as a valuable tool for identifying pneumomediastinum via specific ultrasound signs [4]. Additional investigative modalities such as bronchoscopy, esophagoscopy, or esophagography are not routinely indicated and should be contemplated based on clinical suspicion [4]. Laboratory findings typically lack specificity, with moderately elevated C-reactive protein (CRP) levels and white blood cell counts commonly observed. Although alterations in electrocardiogram (ECG) parameters may manifest, the ECG typically presents as within normal limits [3, 9].

The primary treatment approach for this condition revolves around addressing the underlying cause if identifiable, alongside oxygen therapy and close observation [5]. Oxygen therapy serves to augment the diffusion pressure of nitrogen within the interstitium, facilitating the rapid absorption of free air [2]. Antibiotic therapy is typically not warranted [5]. Vigorous physical activity, notably in sports such as diving, basketball, volleyball, and soccer, has been implicated in the onset of spontaneous pneumomediastinum [11]. Within this patient demographic, delays in seeking emergency department care may ensue, often attributed to their typically good baseline physical condition [11].

Marijuana stands as one of the predominant psychoactive substances globally, with an estimated 48 million individuals acknowledging its use in the United States in recent years [12]. In Colombia, at least 10% of adolescents report experimentation with marijuana at least once in their lifetime [13]. The utilization of marijuana has emerged as a potentially underestimated risk factor for the development of spontaneous pneumomediastinum, with up to 66.7% of diagnosed individuals reportedly associated with its use [14]. Pathophysiologically, this association likely stems from barotrauma incurred during inhalation [15], occurring during actions such as the Valsalva maneuver or forced exhalation against a closed glottis. These maneuvers create a pressure gradient elevating intrathoracic pressure, leading to alveolar overdistension and subsequent rupture within the perivascular space [12, 15]. Furthermore, marijuana can contribute to pneumomediastinum through direct toxic lung injury, induction of vomiting [12], heightened airway permeability, inflammation, and edema [15]. In the second case outlined, the patient had a history of substance use since adolescence and had recently attempted to abstain from marijuana use before symptom onset, followed by subsequent vomiting episodes. In chronic users, such episodes may be attributed to organic reactions associated with withdrawal syndrome [16], overdose from smoking or ingestion of marijuana preparations [17], or cannabis-induced hyperemesis syndrome [16], among other possibilities. Healthcare providers should thus remain vigilant and accord due importance to this association, given its potential ramifications on the etiology, progression, and management of the condition.

After discharge, individuals diagnosed with spontaneous pneumomediastinum necessitate meticulous outpatient monitoring. Follow-up appointments should encompass diagnostic imaging studies until the complete resolution of the condition is confirmed. Furthermore, adherence to bed rest is paramount to mitigate potential complications and expedite the resolution process [2].

Conclusion

Spontaneous pneumomediastinum, while rare in emergency departments, should consistently be considered in the diagnostic approach to chest pain, particularly when accompanied by additional symptoms like dysphagia or neck pain. Thorough interrogation of personal history and potential triggers is essential, with a focused emphasis on events within the preceding 24 hours. Specifically, inquiry regarding marijuana use is imperative, given its recognized role as a primary trigger for the condition. The potential adverse impact of marijuana uses on disease course, including associations with phenomena such as withdrawal syndrome, underscores the importance of proactive management strategies in select cases. Emphasizing complete rest and diligent outpatient follow-up is crucial for achieving full recovery and averting recurrence.

Conflict of Interest

The authors declare no conflict of interest in the publication of this article.

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References

- Salinas Miranda E, Cifuentes LK, Vélez JG, Pinzón BA. Enfoque inicial de las alteraciones mediastinales: revisión de sus referencias anatómicas radiográficas. *Revista Colombiana de Cardiología*. 2018 Nov;25(6):380-395.
- Talwar A, Esquire A, Sahni S, Verma S, Grullon J, Patel P. Spontaneous pneumomediastinum: Time for consensus. *N Am J Med Sci*. 2013;5(8):460.
- Kouritas VK, Papagiannopoulos K, Lazaridis G, Baka S, Mpoukovinas I, Karavasilis V, *et al*. Pneumomediastinum. *J Thorac Dis*. 2015 Feb;7(1):S44-S49.
- Iteen AJ, Bianchi W, Sharman T. Pneumomediastinum [Internet]; c2022 [cited 2023 Jan 7]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK557440/>
- Ojha S, Gaskin J. Spontaneous pneumomediastinum. *BMJ Case Rep*. 2018 Feb 11;bcr-2017-222965.
- Bolvardi E, Pishbin E, Ebrahimi M, Mahmoudi Gharaee A, Bagherian F. Spontaneous Pneumomediastinum with a Rare Presentation. *Case Rep Emerg Med*. 2014;2014:1-3.
- Alaska YA. Spontaneous Pneumomediastinum Secondary to Hookah Smoking. *American Journal of Case Reports*. 2019 May 6;20:651-654.
- Allen CJ, Teisch LF, Stahl KD. Spontaneous pneumomediastinum, pneumopericardium and epidural pneumatosis: insights on clinical management. *Acute Cardiac Care*. 2015 Jan 2;17(1):20-23.
- Silva F A, Barros C D, Raddatz E A. Neumomediastino espontáneo (síndrome de Hamman), una entidad poco frecuente no siempre reconocida. *Revista chilena de cirugía*. 2013 Sep;65(5):442-447.
- Ryoo JY. Clinical Analysis of Spontaneous Pneumomediastinum. *Tuberc Respir Dis (Seoul)*. 2012;73(3):169.
- Mihos P, Potaris K, Gakidis I, Mazaris E, Sarras E, Kontos Z. Sports-related spontaneous pneumomediastinum. *Ann Thorac Surg*. 2004 Sep;78(3):983-986.
- Hasin D, Walsh C. Trends over time in adult cannabis use: A review of recent findings. *Curr Opin Psychol*. 2021 Apr;38:80-85.
- Campo-Arias A, Suárez-Colorado YP, Caballero-Domínguez CC. Association between the use of Cannabis and elevated suicide risk in high school adolescents from Santa Marta, Colombia. *Biomedica*. 2020 Sep 1;40(3):569-577.
- Weiss ZF, Gore S, Foderaro A. Pneumomediastinum in marijuana users: a retrospective review of 14 cases. *BMJ Open Respir Res*. 2019 Feb 12;6(1):e000391.
- Puri C, Rhee K, Harish VK, Slack D. Marijuana induced spontaneous pneumomediastinum. *J Community Hosp Intern Med Perspect*. 2021 Jul 4;11(4):516-517.
- Razban M, Exadaktylos AK, Santa V della, Heymann EP. Cannabinoid hyperemesis syndrome and cannabis withdrawal syndrome: A review of the management of cannabis-related syndrome in the emergency department. *Int. J Emerg Med*. 2022 Dec 8;15(1):45.
- Bonnet U, Preuss U. The cannabis withdrawal syndrome: current insights. *Subst Abuse Rehabil*. 2017 Apr;8:9-37.

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