World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

Spontaneous pneumomediastinum complicating severe asthma exacerbation

Houssam BIBORCHI *, Loubna AJDIR, Saad BOUNHAR, Mohamed IJIM, Oussama FIKRI and Lamyae AMRO

Department of Respiratory Medicine, Arrazi Hospital, Mohammed VI University Hospital Center, LRMS Laboratory, Faculty of Medicine and Pharmacy, Cadi Ayyad University, Marrakech, Morocco.

World Journal of Advanced Research and Reviews, 2025, 25(02), 1873-1877

Publication history: Received on 05 January 2025; revised on 15 February 2025; accepted on 18 February 2025

Article DOI: https://doi.org/10.30574/wjarr.2025.25.2.0496

Abstract

Introduction: Pneumomediastinum is an uncommon condition characterized by the accumulation of air in the mediastinum, which may be secondary to trauma, pneumothorax or perforation of the airways, or spontaneous but can be caused by underlying lung disease, in particular severe acute asthma exacerbation.

Methods: We collected 8 cases of patients who were admitted to our division for pneumo-mediastinum complicating severe asthma exacerbation between January 2020 and December 2023. All our patients underwent a diagnostic protocol including monitoring and chest CT.

Results: The average age of our patients was 21, with a predominance of males. All our patients were known to have asthma but were not followed up and were poorly adherents to treatment, dyspnea was observed in all our patients, the chest X-ray showed linear mediastinal lesion, the CT confirmed the presence of the pneumomediastinum and a pneumopericardium in some patients. Treatment consisted of strict rest, oxygen therapy for hypoxemic patients, treatment of asthma exacerbations, optimization of the controller treatment and therapeutic education.

Conclusions: Pneumomediastinum is a common clinical entity in young adults with severe acute asthma exacerbation, generally benign. This complication can be avoided if asthma is optimally managed.

Keywords: Spontaneous; Pneumomediastinum; Asthma; Exacerbation

1. Introduction

Asthma exacerbation is an acute or subacute episode of progressive worsening of asthma symptoms including shortness of breath, wheezing, cough, chest tightness or any combination of these [1].

Pneumomediastinum (PNM) refers to free air or gas within the mediastinum, resulting from a sudden increase in intra-alveolar pressure leading to a rupture of marginal alveoli and subsequent air tracking along the bronchi and the interstitial and vascular support tissues into the mediastinum (Macklin effect) [2]. The alveolar breach may also cause the rupture of the visceral pleura, result in a pneumothorax [3]. The constellation of disorders caused by the presence of extra alveolar gas has also been termed “air-leak syndrome [4].

It is a benign condition, often occurring after acute asthma exacerbation. sometimes a pneumomediastinum can complicate cystic interstitial lung disease or, rarely, dermatomyositis [5]. The main risk is that it may be misdiagnosed as an aerodigestive fistula, sometimes leading to invasive investigations and treatment [3].

* Corresponding author: H. BIBORCHI.

pathophysiology of PNM in patients with acute severe asthma involves over-expansion of the distal air spaces beyond small airway obstruction that is followed by alveolar rupture, in most cases triggered by violent coughing or straining.

Pneumomediastinum is a well-described complication in the pediatric population in whom an incidence between 0.3 and 5% has been reported in patients hospitalized for an asthma attack [6,7]. The incidence of PNM in adult patients with severe acute asthma continues to be unknown. Only a limited number of case reports and case series have focused on the condition, presumably because of its benign, self-limiting course and the fact that it easily escapes recognition [8].

Pneumomediastinum in association with a severe acute asthma attack can nevertheless, be potentially life-threatening in a minority of individuals due to hemodynamic and/or respiratory compromise requiring chest tube placement and/ or a surgical procedure [9].

2. Patients and methods

We conducted a retrospective analytical study of 8 patients admitted to our department between January 2020 and December 2023 for a severe asthma exacerbation associated with pneumomediastinum.

Severe exacerbation of asthma is defined on the basis of the GINA criteria as: O2 saturation on air <90%, tachycardia>120 bpm, polypnea> 30/min, use of accessory respiratory muscles, peak flow <50% predicted or best

Pneumomediastinum was demonstrated on thoracic CT, and we excluded any cause of pneumomediastinum secondary to trauma, iatrogenic or postoperative.

Were included Patients with an associated pneumothorax but on a non-pathological lung in the absence of pulmonary emphysema, bullae or blebs

The parameters studied in our study were: age, sex, medical history, respiratory symptoms, clinical examination, chest x-ray, thoracic CT scan, therapeutic management, and patient evolution.

3. Results

A total of 8 patients were identified according to the inclusion and exclusion criteria previously defined. The average age was 21 years with a range from 16 to 28. 90% were male.

All our patients are known to have asthma but are not properly observed or adherent to their treatment. The most frequently reported symptoms were dyspnea and cough in all of our patients followed by vomiting in 50%.

Relevant findings on physical examination included subcutaneous emphysema in 50% (4 of 8) in the cervicothoracic region and diffuse sibilants.

All our patients had Radiologic images upon admission included X ray and chest CT. The X ray revealed mediastinal air and subcutaneous air in all of the patients. The CT scan confirmed the presence of mediastinal air and revealed the presence of air in the pericardium and minor pneumothorax in 66% of the patients (5 of 8 patients).

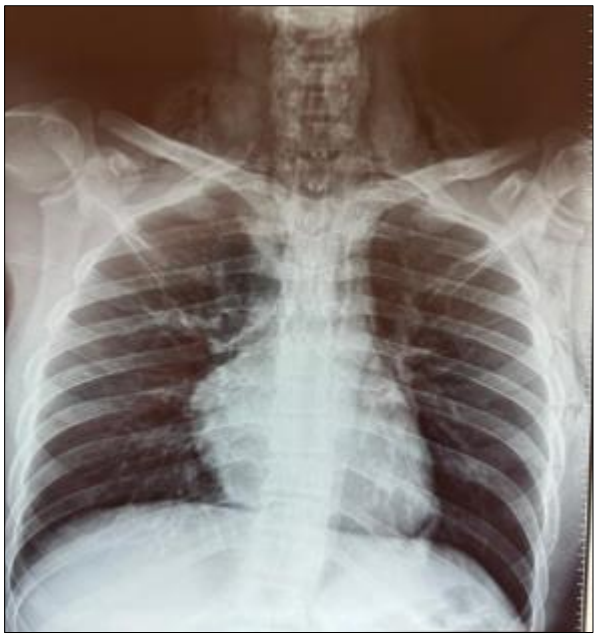
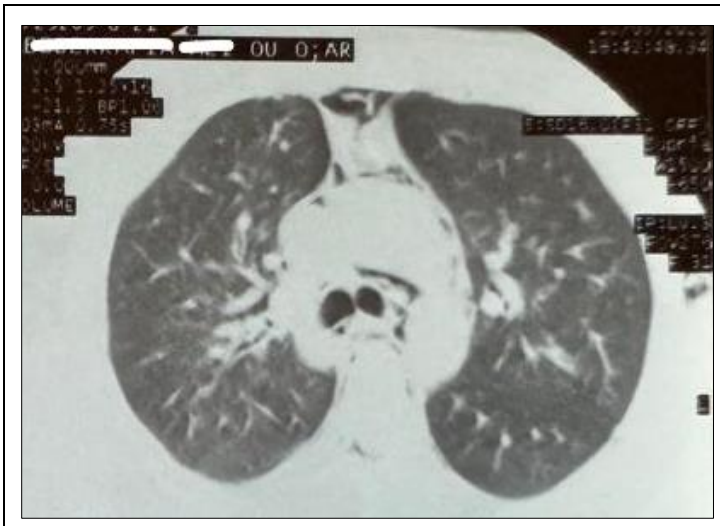
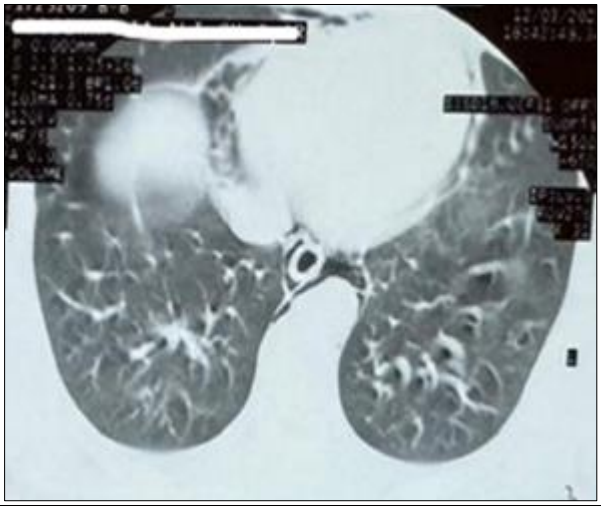


Figure 1 chest Xray of patient showing the presence of subcutaneous emphysema and mediastinal air



a



b

Figure 2 a and b: thoracic CT scan showing mediastinal air

Among the suspected triggering factors in the origin of asthma exacerbation, viral pulmonary infection in the first instance in 90% of our patients add to that the poor adherence to the daily asthma treatment. rhinovirus and enterovirus were the main virus incriminated, isolated by polymerase chain reaction test (PCR) in the sputum.

33% of the patients were initially admitted in the ICU, In the majority of cases, patients were placed on oxygen, and treated expectantly. treatment of asthma exacerbation, optimization of background treatment and insisting on daily treatment of asthma.

The management of patients presenting pneumothorax associated with pneumomediastinum was a conservative approach based on rest and oxygenation.

No patient underwent invasive treatment. All our patients had a favorable evolution.

4. Discussion

Spontaneous pneumomediastinum is defined as the presence of air in the mediastinal structures without any obvious cause. was first reported in 1939 by Hamman [10].

The pathophysiological mechanisms of spontaneous pneumomediastinum are poorly defined and the hypothesis most often reported in the literature is that of an endobronchial hyper pressure with closed glottis. This hyper pressure would be responsible for alveolar rupture near the vascular septa, the latter draining the aerated effusion thus created towards the mediastinum. This is a common mechanism with some spontaneous pneumothoraxes [11].

There does not seem to be any really identified favoring factor, although some series report a number of asthmatic patients for whom it may be a mode of revelation of the disease. Lung injuries produced by prolonged, high trans-alveolar pressure could lead to alveolar rupture into the perivascular space with subsequent pneumomediastinum.

The results of many studies showed that pneumomediastinum is a rare condition in adult patients with severe acute asthma exacerbations and that its presence should be suspected in particular in young adult patients.

The typical clinical form is that of a picture of retrosternal chest pain occurring in a young adult. In the literature, this functional sign is present two out of three times. A persistent cough is observed in 50% of patients and cervical discomfort in a third of them.

The examination sign, key to the diagnosis, is subcutaneous emphysema usually localized to the left hemithorax and the anterior cervical region. Hamman's sign is an auscultatory crepitation synchronous with the heartbeat, pathognomonic of pneumomediastinum [14].

acute bronchial asthma is only rarely associated with PNM which is found in approximately 0.3% of cases. Such a low incidence could be explained by the fact that the pneumomediastinum diagnosis was made solely on the basis of chest X-rays, meaning that those patients requiring CT for identification were missed [12]. Indeed, although chest X-ray represents the standard procedure in this situation, approximately 30% of spontaneous PNM cases are routinely missed by that imaging procedure [13].

In our case study series, chest CT scan was used to confirm and assess pneumomediastinum to all our patients.

The natural evolution of spontaneous pneumomediastinum is towards recovery in 48-96 hours with complete disappearance of clinical and radiological signs. No specific therapy, in particular antibiotic and oxygen therapy, seems to have proven its effectiveness. Recurrences appear to be rare. Complications are exceptional, however, cases of compressive pneumomediastinum with tamponade requiring surgical drainage have been described [15].

Spontaneous pneumomediastinum is therefore the only clinical event in which the presence of air in the media should not be considered serious and should not trigger a multitude of additional examinations on a routine basis [16]. In our case series the median hospital stay was 8 days including patients with pneumothorax and pneumopericardium and all patients had a good outcome with no further deterioration.

5. Conclusion

These findings have led us to conclude that spontaneous pneumomediastinum is a common condition in young adults with severe acute asthma exacerbation and in the vast majority of cases is benign. It should be suspected in exacerbated patients who are not responding to initial medical treatment.

Since Pneumomediastinum can be easily missed by a standard chest X-ray, subjects at risk should undergo CT scan.

This complication can be avoided by optimizing the management of asthma.

Compliance with ethical standards

Disclosure of conflict of interest

All the authors: Houssam BIBORCHI, Loubna AJDIR, Saad BOUNHAR, Mohamed IJIM, Oussama FIKRI and Lamyae AMRO report no conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] Kenyon N, Zeki AA, Albertson TE, Louie S. Definition of critical asthma syndromes. Clinic Rev Allerg Immunol. 2015 Feb;48(1):1-6 10.1007/s12016-013-8395-6.

[2] Wintermark M, Schnyder P. The Macklin effect: a frequent etiology for pneumomediastinum in severe blunt chest trauma. Chest. 2001 Aug;120(2):543-7. 10.1378/chest.120.2.543.

[3] Ghislain BOUGMA, Abdoul Risgou OUEDRAOGO, Jules Christian MINOUNGOU, Julienne OUEDRAOGO, Rosalie Patricia OUEDRAOGO, Lakinapin Aboubacar DRABO, David LAMIEN, Kadidiatou BONCOUNGOU, Georges OUEDRAOGO, Gisèle BADOUM, Martial OUEDRAOGO. J Func Vent Pulm 2023;44(14):53-56 10.12699/jfvpulm.14.44.2023.53

[4] Takeishi T, Nishima S, Kano S. Air leak syndrome (ALS) as complication of asthma. Acta Paediatr Jpn1989 Jun;31(3):330-4. 10.1111/j.1442 200x.1989.tb01309.x.

[5] Godbert B, Nguyen Thi Dieu H, Vu Van G. Pneumomediastinum in dermatomyositis. J Func Vent Pulm 2010;01(01):83-85.

[6] Stack AM, Caputo GL. Pneumomediastinum in childhood asthma. Pediatr Emerg Care. 1996;12:98-101 10.1097/00006565-199604000-00008.

[7] Tortajada-Girbés M, Moreno-Prat M, Ainsa-Laguna D, Mas S. Spontaneous pneumomediastinum and subcutaneous emphysema as a complication of asthma in children: case report and literature review. Ther Adv Respir Dis. 2016;10:402-409 10.1177/1753465816657478.

[8] Narula T, Barthwal MS, Deoskar RB Retd, Rajan KE Retd, Sharma SK. Pneumomediastinum - An uncommon complication of acute severe asthma. Med J Armed Forces India. 2006;62:394-395. 10.1016/S0377-1237(06)80125-5

[9] Karakaya Z, Demir S, Sagay SS, Karakaya O, Ozdinç S. Bilateral spontaneous pneumothorax, pneumomediastinum, and subcutaneous emphysema: rare and fatal complications of asthma. Case Rep Emerg Med. 2012;2012:242579. 10.1155/2012/242579

[10] Langwieler TE, Steffani KD, Bogoevski DP, Mann O, Izbicki JR: Spontaneous pneumomediastinum. Ann Thorac Surg. 2004, 78:711-3. 10.1016/j.athoracsur.2003.09.021

[11] 4. Shennib HF, Barkun AN, Matouk E, Blundell PE: Surgical decompression of a tension pneumomediastinum. A ventilatory complication of status asthmaticus. Chest. 1988, 93:1301-2. 10.1378/chest.93.6.1301

[12] Maunder RJ, Peirson DJ, Hudson LD. Subcutaneous and mediastinal emphysema: pathophysiology, diagnosis and management. Arch Intern Med 1984; 144:1447-1153. PMID: 6375617

[13] Kaneki T, Kubo K, Kawashima A, Koizumi T, Sekiguchi M, Sone S. Spontaneous pneumomediastinum in 33 patients: yield of chest computed tomography for the diagnosis of the mild type. Respiration. 2000;67:408-411. 10.1159/000029539

[14] Sakai M, Murayama S, Gibo M, Akamine T, Nagata O: Frequent cause of the Macklin effect in spontaneous pneumomediastinum: demonstration by multidetector-row computed tomography. J Comput Assist Tomogr. 2006, 30:92-4. 10.1097/01.rct.0000187416.07698.8d

[15] Panacek EA, Singer AJ, Sherman BW, Prescott A, Rutherford W: Spontaneous pneumomediastinum: clinical and natural history. Ann Emerg Med. 1992, 21:1222-7. 10.1016/s0196-0644(05)81750-0

[16] Rachid C, Romane L, Ait Batahar S, Amro L . (May 13, 2022) Spontaneous Pneumomediastinum Revealing Asthma: The Macklin Effect. Cureus 14(5): e24978. 10.7759/cureus.24978