

Spontaneous Pneumomediastinum: A Case Report of 27 Patients

H. Benjelloun^{1*}, A. Rattal¹, A. Amir¹, H. Harraz¹, N. Zaghba¹, K. Chaanoun¹, N. Yassine¹¹Pulmonology Department, CHU Ibn Rochd CasablancaDOI: [10.36347/sjmcr.2024.v12i05.021](https://doi.org/10.36347/sjmcr.2024.v12i05.021)

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*Corresponding author: H. Benjelloun

Pulmonology Department, CHU Ibn Rochd Casablanca

Abstract

Original Research Article

Spontaneous pneumomediastinum is defined as the presence of air in the mediastinum in the absence of traumatic or iatrogenic cause. Diagnosis is based on chest X-ray. Other paraclinical examinations, such as chest tomodensitometry or bronchial or gastrointestinal endoscopy, are sometimes necessary. Outcome is most often favorable. We report 27 cases of spontaneous pneumomediastinum whose data were collected in the Department of Respiratory Diseases at the Ibn Rochd University Hospital in Casablanca between 2008 and 2023. The study involved 19 men and eight women, with an average age of 37 years. Clinical symptomatology was dominated by retrosternal chest pain. The circumstances of onset of pneumomediastinum were coughing spell in 11 cases, hookah consumption in two cases and iterative vomiting in three cases, childbirth and exacerbation of chronic obstructive pulmonary disease (COPD) of bacterial origin in five cases. Outcome was favorable in all cases with spontaneous resorption of the pneumomediastinum with only one death. No recurrence occurred after a minimum follow-up period of 3 years.

Keywords: Pneumomediastinum, chest X-Ray, exacerbation, treatment, complication.

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INTRODUCTION

Spontaneous pneumomediastinum is a rare condition that occurs mainly in lean, lanky adolescent and young adult males. It is usually benign, but occasionally severe. The pathophysiological mechanism of spontaneous pneumomediastinum remains poorly elucidated. Our aim is to evaluate the epidemiological, ethiopathogenic, clinical, therapeutic and evolutionary features of spontaneous pneumomediastinum.

METHODS

We report a retrospective study of 27 cases of spontaneous pneumomediastinum collected at the respiratory diseases department of CHU Ibn Rochd, Casablanca, over a 16-year period from January 2008 to July 2023. The diagnosis of pneumomediastinum was based on chest radiography. No patient had experienced thoracic trauma or iatrogenic manoeuvres likely to cause injury to the tracheobronchial tree before the onset of pneumomediastinum.

RESULTS

There were 19 men and eight women, with an average age of 37 years, ranging from 16 to 73 years. Eight patients had asthma and four had allergic rhinitis. Eight patients were smokers, three of whom used

cannabis. Two patients had a history of pulmonary tuberculosis. The circumstances of onset of pneumomediastinum were coughing fits complicating an asthma attack in 11 cases, hookah smoking in two cases and iterative vomiting in three cases, childbirth and a bacterial exacerbation of COPD in five cases each, and heavy physical exertion in only one case. Clinical symptoms were dominated by chest pain in 17 patients, dyspnoea in 18 and dry cough in 11. Clinical examination revealed cervico-thoracic subcutaneous emphysema with snowy crepitations in 12 cases, sibilant rales in seven cases and an air effusion syndrome in five cases, 11 patients desaturated to less than 93% with polypnoea and tachycardia. Hammam's sign, which corresponds to a crackling sound on auscultation of the precordial area synchronous with heart sounds, was found in only one patient. Chest X-rays revealed pneumomediastinum in all patients and cervicothoracic soft-tissue emphysema in ten, associated with pneumothorax in eight cases, with continuous diaphragm sign in four and pneumopericardium in one.

Chest computed tomography (CT), performed in 19 patients, confirmed the diagnosis of mediastinal pneumothorax and revealed cervicodorsal pneumothorax in three cases, pneumopericardium in two cases, bilateral emphysema bullae in five cases with a focus of condensation in one case (Figures 1,2,3) and diffuse

infiltrative pneumopathy at the fibrosis stage in two cases. In order to rule out a lesion of the tracheobronchial tree or an endo-bronchial obstruction, flexible bronchoscopy was performed on ten patients, revealing an inflammatory state with thickening of the spurs in four cases, the presence of a budding tumor in two and a normal appearance in four. Patients with asthma or COPD were treated for exacerbations with antibiotics and corticosteroids, with adjustment of background therapy and patient education. Patients were monitored

several times a day, in particular for respiratory rate, heart rate, blood pressure, oxygen saturation and temperature. The outcome was favorable in 27 cases, with spontaneous resorption of pneumomediastinum, pneumorachis and pneumopericardium, and death in one case. The average hospital stay was 10 days, with extremes ranging from four to 17 days. The mean follow-up period was 3 years (extremes: 2 months and 10 years), with no distant recurrence.

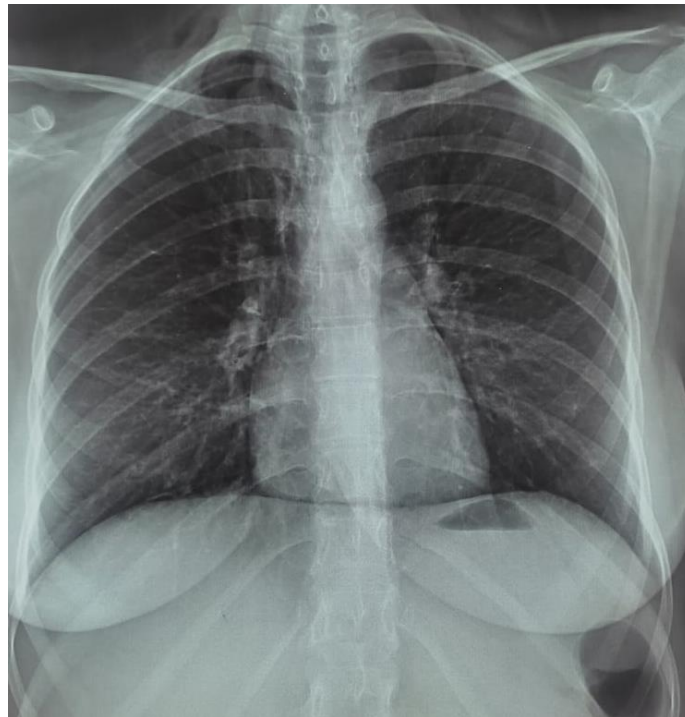


Figure 1: Chest X-ray showing pneumomediastinum, cervicothoracic soft tissue emphysema and continuous diaphragm sign

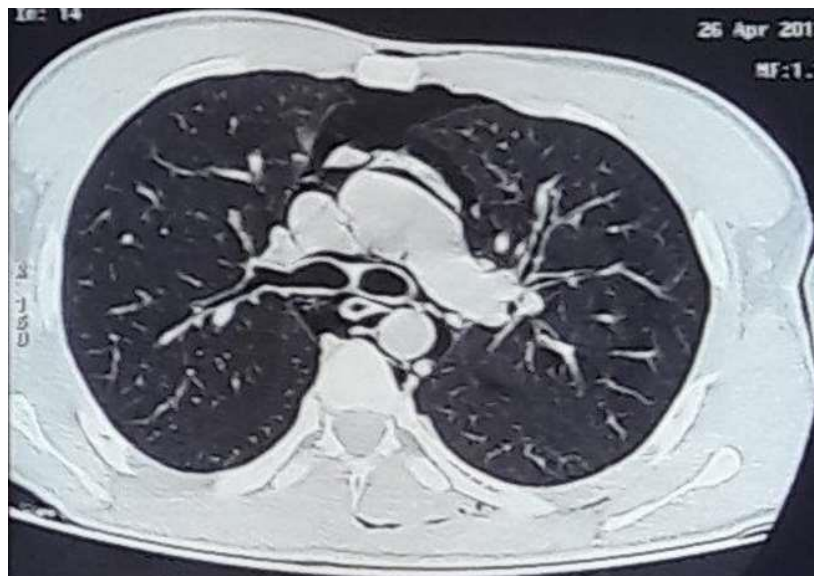


Figure 2: Chest CT scan showing spontaneous pneumomediastinum associated with cervicothoracic soft tissue emphysema following an asthma attack



Figure 3: Chest CT scan showing pneumomediastinum, pneumopericardium, pneumorachis and soft tissue emphysema in a 19-year-old patient with recurrent vomiting

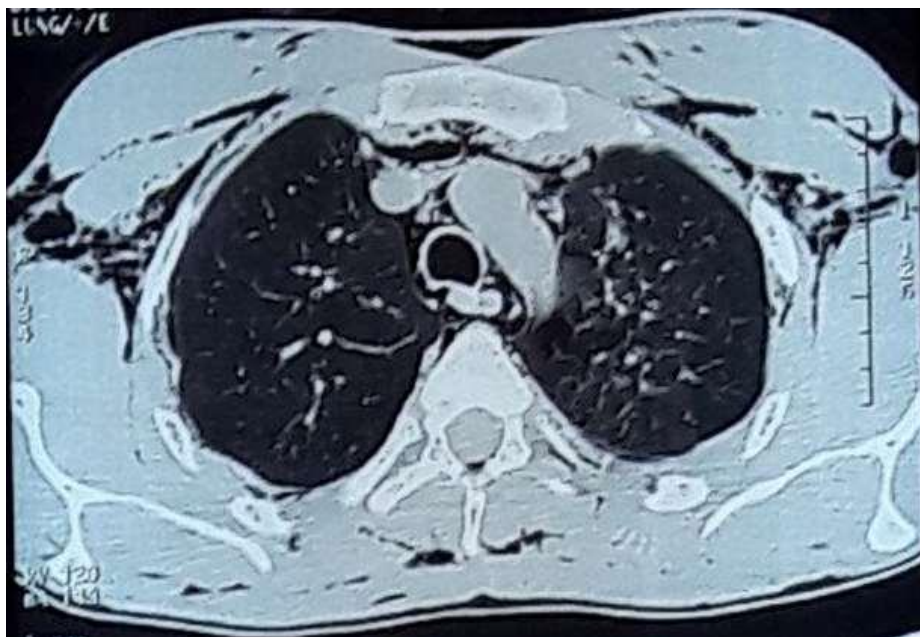


Figure 4: Exacerbation of chronic obstructive pulmonary disease complicated by pneumomediastinum associated with soft tissue emphysema

DISCUSSION

Spontaneous pneumomediastinum is a rare pathology, the first formal medical documentation of which was produced by Simmons in 1784 [1]. Subsequently, Hamman meticulously established the clinical features of spontaneous pneumomediastinum [2]. Spontaneous pneumomediastinum can occur in patients with no pulmonary pathology, following a sudden increase in intra-alveolar pressure [3]. The initial clinical presentation may suggest a rupture of the aerodigestive tract. The mechanism of spontaneous pneumomediastinum is still poorly defined, and the

hypothesis most often reported in the literature is that of endo-bronchial hyperpressure with the glottis closed, due to manoeuvres of Valsalva. This hyperpressure would be responsible for an alveolar rupture, and so air will pass through the interstitial spaces into the mediastinum, progressing along the bronchovascular axes to the hilum, then to the subcutaneous tissues and deep cervical spaces, and eventually to the pericardium and epidural space through the holes of conjugation [4, 6]. The alveolar breach may also occur peripherally, through the visceral pleura, creating an associated pneumothorax. Closed-glot hyperpressure may be secondary to acute bronchial obstruction, as in asthma attacks and foreign-

body inhalation [7, 8]; or in the case of mechanical ventilation using large volumes and/or high end-expiratory pressure values; or during a hacking cough or efforts to vomit [9, 10]; and finally during a Valsalva maneuver such as defecation, the Hemlich maneuver or voluntary inhalation of cocaine, marijuana or ecstasy [11, 12]. A second mechanism of spontaneous pneumomediastinum involves direct injury to the alveolar walls [13, 14]. This is the case with bacterial pneumopathies, mainly staphylococcus aureus, viral pneumopathies (influenza, measles, whooping cough) and parasitic pneumopathies, notably pneumocystis in immunocompromised patients [13, 15]. Tuberculous miliaria can also be complicated by pneumomediastinum, as can diffuse infiltrative pneumonitis at the fibrosis stage [14]. The most frequent mechanism in our series was closed glottis hyperpressure. The clinical picture is dominated by sudden onset retro-sternal chest pain in 75% of cases. Cough is present in 40% of cases. In our series, chest pain was the most frequent symptom, reported in 75% of patients. These data concur with those of the literature: in the series by Alemu BN *et al.*, [16] and P. Dionisio *et al.*, [17], chest pain, dyspnea and dry cough were the main symptoms. Symptoms associated with dysphagia and fever are warning signs and should raise the suspicion of pneumomediastinum secondary to rupture of the aerodigestive tract, which progresses to mediastinitis, a diagnostic and therapeutic emergency.

Emphysema was present in 44% of cases, with a value close to that observed in the studies by Kyung SK *et al.*, [18] and Valerio Perna *et al.*, [19]; however, the studies by I. Zendah [20] and I. Patricia Dionisio [21] found higher values. Hamman's sign is found in only 3.7% of cases. It is a pathognomonic sign of pneumomediastinum, in the form of bullous noises synchronous with the heartbeat. It was found in 29% of cases in Edward A *et al.*, [22]. Chest X-rays reveal fine, linear intra-mediastinal clearances bounded on the outside by the pleura, which appears as a fine opaque border. The air then delimits the aortic button, the descending aorta and the cardiac silhouette [23, 24]. The characteristic continuous diaphragm sign is found in 14% of our patients. Occasionally, pneumomediastinum is only visible on the profile X-ray, as retro-sternal clearness or clear lines bordering the aortic arch or delimiting the anterior wall of the trachea. Chest X-rays can also demonstrate cervicothoracic soft-tissue emphysema or associated pneumothorax [25]. However, Kaneki finds that 30% of pneumomediastinum cases are unrecognized by chest radiography alone [26].

Spontaneous pneumomediastinum is a benign pathology whose spontaneous evolution leads to resorption within 48 to 96 hours by direct passage of air into the bloodstream. Further investigations are therefore rarely necessary. Thoracic computed tomography shows air dissection of all the anatomical structures of the mediastinum and neck. It is indicated in cases of

Esophageal transit with hydrosolubles is indicated in cases of suspected esophageal rupture recognized by extravasation of the contrast medium. Management of spontaneous pneumomediastinum is based on symptomatic treatment. However, rare cases of compressive pneumomediastinum have been described [27], with tamponade requiring surgical drainage. Recurrences are very rare [24, 28].

CONCLUSION

Spontaneous pneumomediastinum is a rare benign condition that most often occurs in young people. Its pathophysiological mechanism is poorly understood. Its management is based on symptomatic treatment and a search for the cause. However, it can be fatal in cases of compressive pneumomediastinum, so close monitoring is essential.

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