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(CASE REPORT)

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Spontaneous subcutaneous emphysema associated with pneumomediastinum, pneumothorax, pneumopericardium and pneumotaches in a young patient with asthma attack: A case report

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Abstract

Background: Spontaneous pneumomediastinum with associated subcutaneous emphysema is rare, and its coexistence with pneumothorax, pneumopericardium, and pneumorachis is exceptional.

Case presentation: We report the case of a 21-year-old male with uncontrolled asthma who presented with acute chest pain, dyspnea, and cervicofacial swelling. Imaging revealed subcutaneous emphysema, pneumomediastinum, pneumopericardium, right pneumothorax, and pneumotaches. The patient was managed conservatively with oxygen, corticosteroids, and bronchodilators, with complete resolution within one week.

Conclusion: This case illustrates a rare but generally benign complication of asthma exacerbation. Early recognition, appropriate imaging, and conservative management are crucial to prevent misdiagnosis and avoid unnecessary invasive procedures.

Keywords: Spontaneous Subcutaneous Emphysema; Pneumomediastinum; Pneumothorax; Pneumopericardium; Pneumotaches; Asthma

1. Introduction

The association of pneumothorax with pneumomediastinum, pneumopericardium and spontaneous pneumotaches with subcutaneous emphysema is a rare and exceptional entity of varied etiology. Its mechanism is still poorly defined, and the hypothesis most often reported in literature is that of endobronchial hyper pressure with closed glottis, due to Valsalva maneuvers. It is a generally benign pathology that requires strict clinical monitoring with symptomatic treatment, but sometimes it can be serious by compression of the cervical and mediastinal structures and therefore life-threatening. We report a case illustrating this association.

2. Clinical case

This is a 21-year-old male patient, a chronic smoker (2 packs per day) who has not quit. He has poorly controlled asthma for 9 years, along with allergic rhinitis, and a history of SARS-CoV-2 pneumonia treated without the need for oxygen therapy. The patient was admitted to the pulmonology department for acute chest pain described as stabbing (VAS 8/10), with acute dyspnea classified as stage II on mMRC scale, and a dry, paroxysmal cough. He reported no recent trauma, recurrent respiratory infections, digestive symptoms, or recent interventions. The general examination revealed facial and cervical edema. The pulmonary examination noted wheezing during forced expiration and crackling

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sensation in the facio-cervical-thoracic region, indicating the presence of subcutaneous emphysema. The rest of the physical exam was normal. Chest X-ray showed pneumomediastinum with linear lucencies above the diaphragm and pneumopericardium enveloping the cardiac silhouette on the left side, along with cervical subcutaneous emphysema (Fig.1). A cervical-thoracic CT scan revealed diffuse cervical-thoracic emphysema affecting the soft tissues, responsible for the pneumomediastinum and pneumopericardium. There was also a right-sided pneumothorax and pneumorachis observed, without any emphysematous blebs (Fig.2 Fig.3).

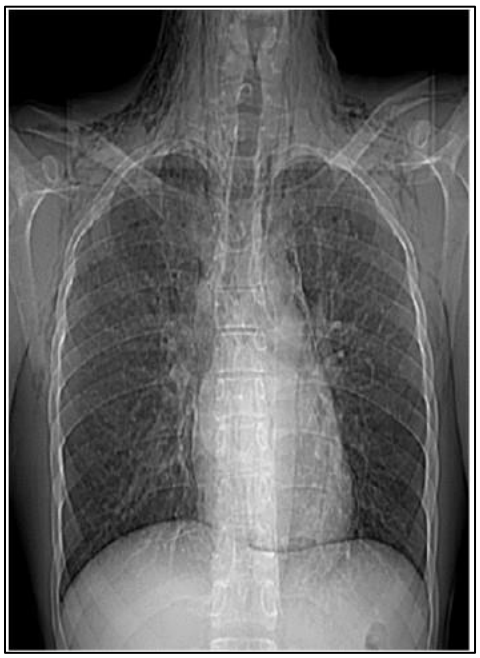

Figure 1 Chest X-ray (frontal view) shows diffuse cervicothoracic subcutaneous emphysema with air outlining the soft tissues of the neck and chest wall, as well as pneumomediastinum

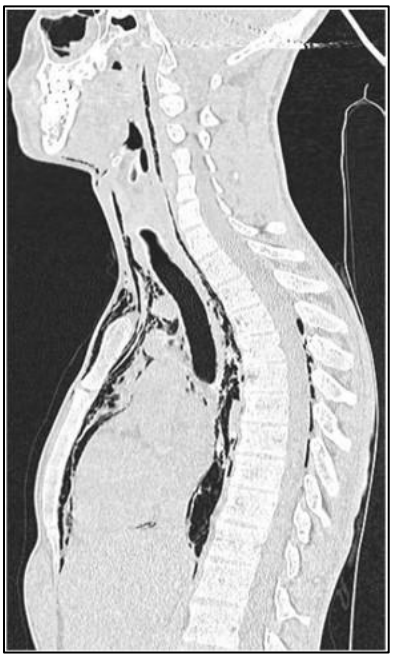

Figure 2 Sagittal CT scan shows extensive cervicothoracic subcutaneous emphysema with pneumomediastinum and associated pneumorachis

We recommended hospitalization to monitor clinical and radiological evolution, with bed rest, oxygen therapy at 2 L/min and treatment of asthma (maintenance therapy and reliever treatment). By day 4 of admission, the patient

showed significant improvement both clinically and radiologically (Complete resolution of all radiological abnormalities on follow-up cervico-thoracic CT scan on day 7). The etiological investigations including flexible nasofibroscopy and bronchofibroscopy were negative, leading to the conclusion that the effort during paroxysmal coughing caused the endothoracic hyperpressure responsible for this condition.

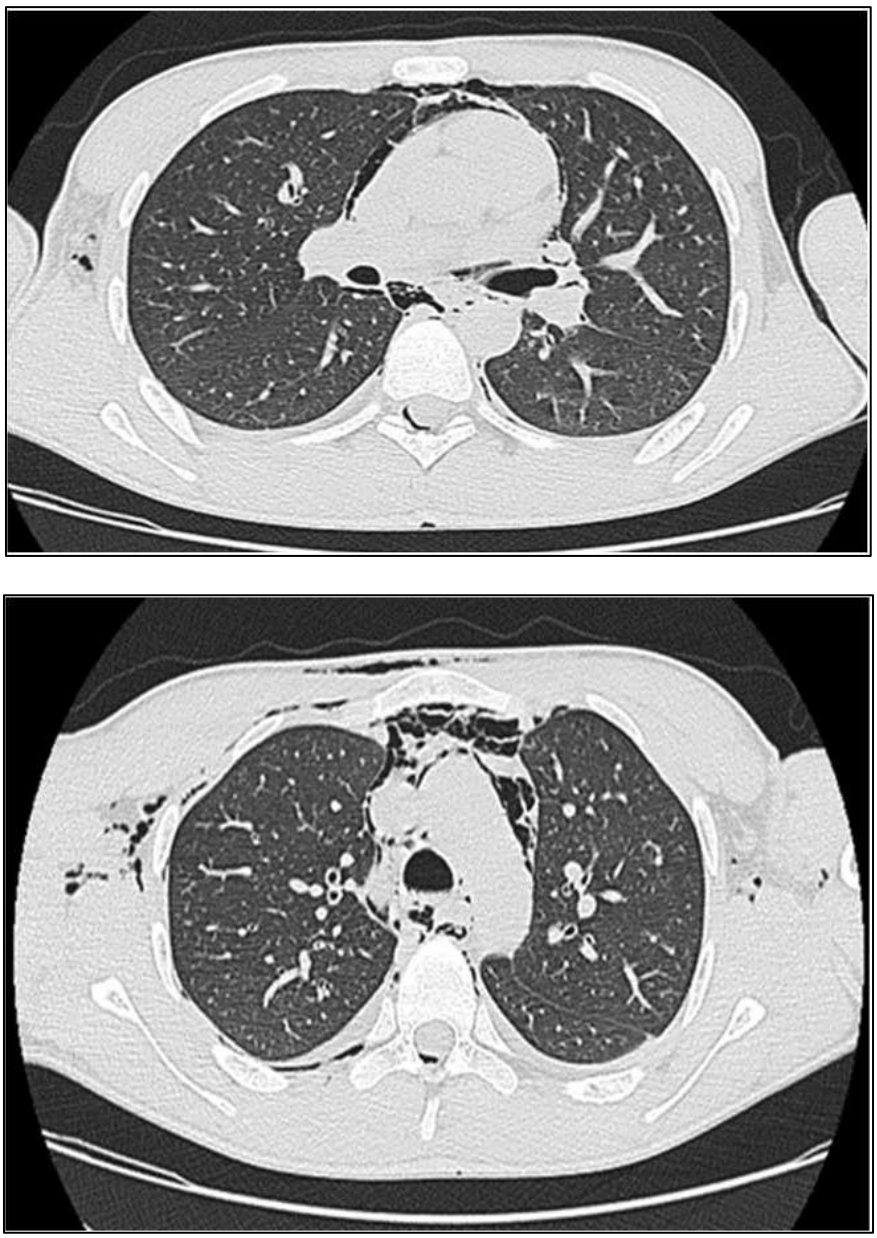

Figure 3 Axial chest CT images demonstrate extensive pneumomediastinum with subcutaneous emphysema, pneumorachis and, pneumopericardium

3. Discussion

Spontaneous subcutaneous emphysema associated with pneumomediastinum, pneumothorax, pneumopericardium and pneumorachis is an exceptional clinical entity. The pathophysiology most often invoked is that of endobronchial hyperpressure with closed glottis (Macklin effect), caused by vigorous coughing or Valsalva maneuvers, leading to alveolar rupture and air dissection along the bronchovascular sheaths into the mediastinum, then spreading into the cervical subcutaneous tissues, pericardium, and epidural space (1,2).

Primary spontaneous pneumomediastinum predominantly affects young individuals, with incidence estimates ranging from 1 in 14,000 to 1 in 25,000 (3), Predisposing factors include asthma exacerbations, substance use (e.g., marijuana),

and Valsalva-like maneuvers (3,4). Pneumorachis remains particularly uncommon, generally extradural and asymptomatic, with only sporadic reports linked to asthma (5,6). Pneumopericardium is also rare but can lead to tamponade in severe cases (7).

Patients typically present with acute retrosternal chest pain, dyspnea, and cervicofacial swelling due to subcutaneous emphysema. Radiological evaluation is essential: chest radiography may detect mediastinal air, but CT scanning is the gold standard to detect subtle air collections (8).

Despite alarming radiological findings, the course is usually benign under conservative treatment (oxygen, rest, analgesia, and asthma control), provided close monitoring is ensured(2). Our case strengthens existing evidence that extensive multifocal air dissection in asthma may resolve completely with supportive care, avoiding unnecessary invasive procedures.

4. Conclusion

The association of subcutaneous emphysema, pneumomediastinum, pneumothorax, pneumopericardium, and pneumorachis in our patient is exceptional. It is a benign pathology that generally requires strictly symptomatic medical treatment, low-flow nasal oxygen therapy, first class analgesics. This clinical presentation is marked by a generally favorable evolution but can sometimes lead to a life-threatening outcome if treatment is delayed.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

Statement of informed consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

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