

## LETTER TO THE EDITOR

### MDCT FEATURES OF SPONTANEOUS PNEUMOMEDIASTINUM BY MACKLIN EFFECT

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Dear editor, we read with great interest the two recent case reports about pneumomediastinum: "Complicated pulmonary interstitial emphysema" reported by C. Altay (JBR-BTR, 2011, 94: 84) and "Spontaneous soccer-induced pneumomediastinum in a 39-year-old man" reported by K. De Smet (JBR-BTR, 2011, 346-347). We would like to widen this subject, reporting a case of massive spontaneous pneumomediastinum by Macklin effect in a 25-year-old man. High quality MDCT series, associated to scientific literature review, allow us to highlight the the CT appearance of the Macklin effect leads us to affirm the spontaneous origin of the pneumomediastinum and thus permitting to be reassuring.

Our patient, a previously healthy 25-year-old man, entered the hospital complaining of acute retrosternal

pain which worsened with deep breathing and shortness of breath. Cardio-pulmonary examination, blood test and electrocardiogram were reassuring.

Chest radiography revealed pneumomediastinum with gas collection dissecting the tissues of the neck (Fig. 1). A computed tomography (CT-scan) was performed and massive pneumomediastinum was confirmed, along with subcutaneous emphysema and a small left pneumothorax (Fig. 2-3). There was no pleural effusion. We also detected some free air collection along the segmental and lobar bronchi and pulmonary arteries representing interstitial pulmonary emphysema. These CT features indicated the spontaneous origin of pneumomediastinum which in turn helped us to be reassuring in our approach. Nevertheless, an esophagoscopy

and endoscopy of the upper airways were performed and were normal. The patient was treated with 48-hour medical observation. During that time, clinical manifestations were resolved and radiographic signs of conditions disappeared.

Spontaneous pneumomediastinum (SP) is defined as the non-traumatic presence of free air in the mediastinum of a patient with no known underlying disease. It is a probably underestimated condition that has been observed to occur in young adults.

According to scientific literature (1-4), the clinical presentation of SP in the majority of the cases associated with acute retrosternal chest pain (60 to 70%), coughing (25 to 40%), shortness of breath (25 to 67%) and subcutaneous emphysema (40 to 80%) at the physical examination. Dysphagia and neck pain are also

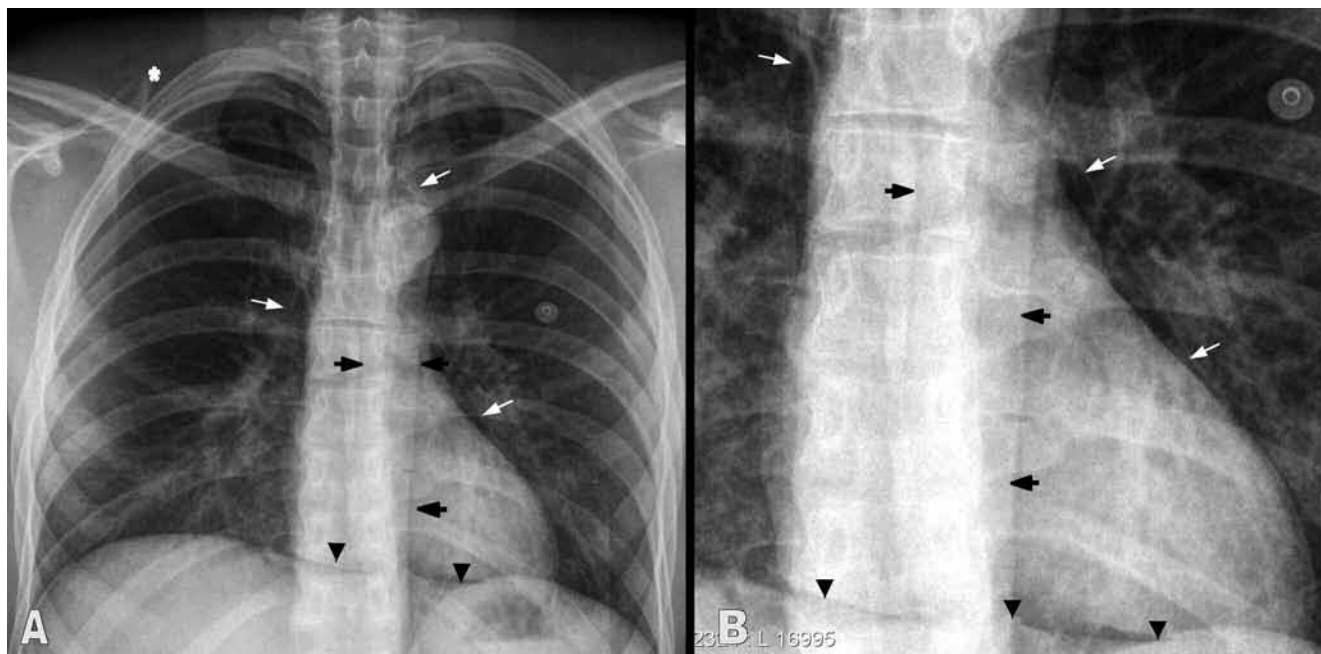
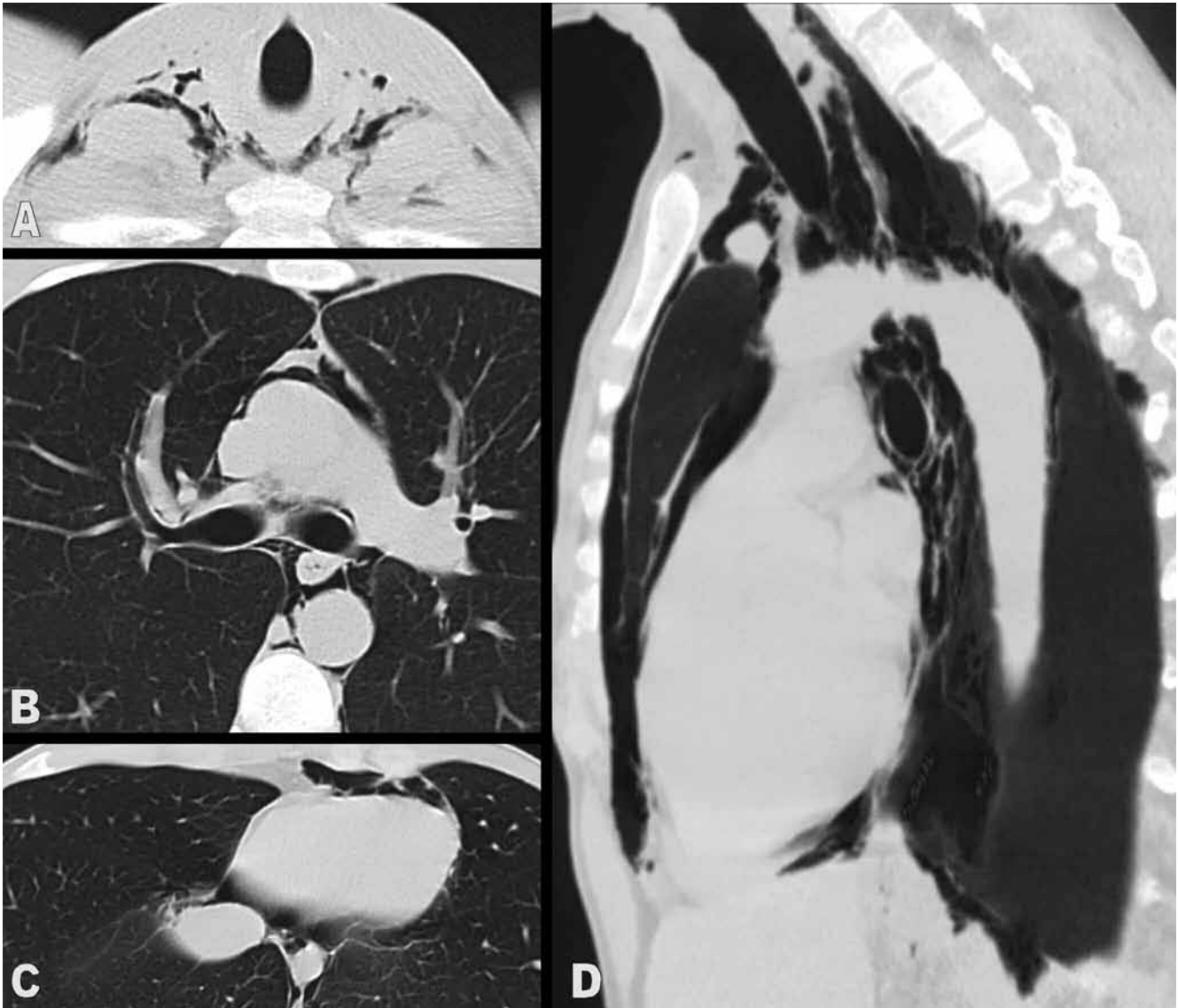


Fig. 1. — A. Initial anteroposterior radiograph shows continuous diaphragm sign (black arrowheads) due to air trapped posterior to the pericardium and linear band of mediastinal air outlining the descending aorta (horizontal black arrows). Subtle subcutaneous emphysema is observed over the right clavicle (asterisk). Pneumomediastinum reveals the pleural surface (white arrows) delineating the mediastinal compartment. B. Detail of initial radiographs.

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*Fig. 2.* — Axial CT views of the (A) basicervical subcutaneous emphysema, (B) sub-carina mediastinum and (C) inferior mediastinum with pneumopericardium. (D) minIP sagittal reformat view demonstrates the pneumomediastinum extension. Mediastinal structures are surrounded by air and become visible on radiographs.

possible. SP should be considered in the differential diagnosis of acute chest pain.

In fact, the “spontaneous” mediastinum is rarely truly spontaneous, but caused by an acute raised intraalveolar pressure: a high-pressure gradient between distal alveoli and pulmonary interstitium leads to alveolar rupture. This causes the free gas to dissect along the peribronchovascular fascial sheaths (interstitial emphysema), into the hilum and then into the mediastinum. Once the gas is in the mediastinum, it can then track to cervical soft tissues (or even to retroperitoneum) producing subcutaneous emphysema. This physiopathology process was initially described by Macklin and Macklin. In the SP of a young adult, a precipi-

tating factor (related to Valsalva manoeuvre) is often present: exacerbation of asthma, cough (infection of upper airways), vomiting, sneezing, inhalation of drugs (speed, cocaine, amphetamine-derived drugs).

In the case discussed above, the patient inhaled an illicit drug (amphetamine-derived) 36 hours before the symptoms reportedly began.

In suspicion of pneumomediastinum, a CT-scan is the main relevant additional test to perform (5). A minority of cases of pneumomediastinum can be overlooked with chest radiography; alternately, CT-scan reveals pneumomediastinum in 100% of the patients tested (1). After the diagnosis of pneumomediastinum, the most critical issue is in

determining if pneumomediastinum is spontaneous or secondary to esophageal or airway perforation. Actually, a lot of investigations are often performed (esophagography or contrast-enhanced swallow chest-CT, esophagogastroduodenoscopy and bronchoscopy), especially in presence of history of vomiting or cough. However, these patients are often over-evaluated and thus, the additional tests are almost invariably negative in their results (1, 4). In this context, perform a chest CT can allow the radiologist to diagnose the spontaneous origin of pneumomediastinum. At first, analysis of the pulmonary parenchyma should be normal. This rules out any underlying chronic pulmonary disease related to pneumomediastinum such as:

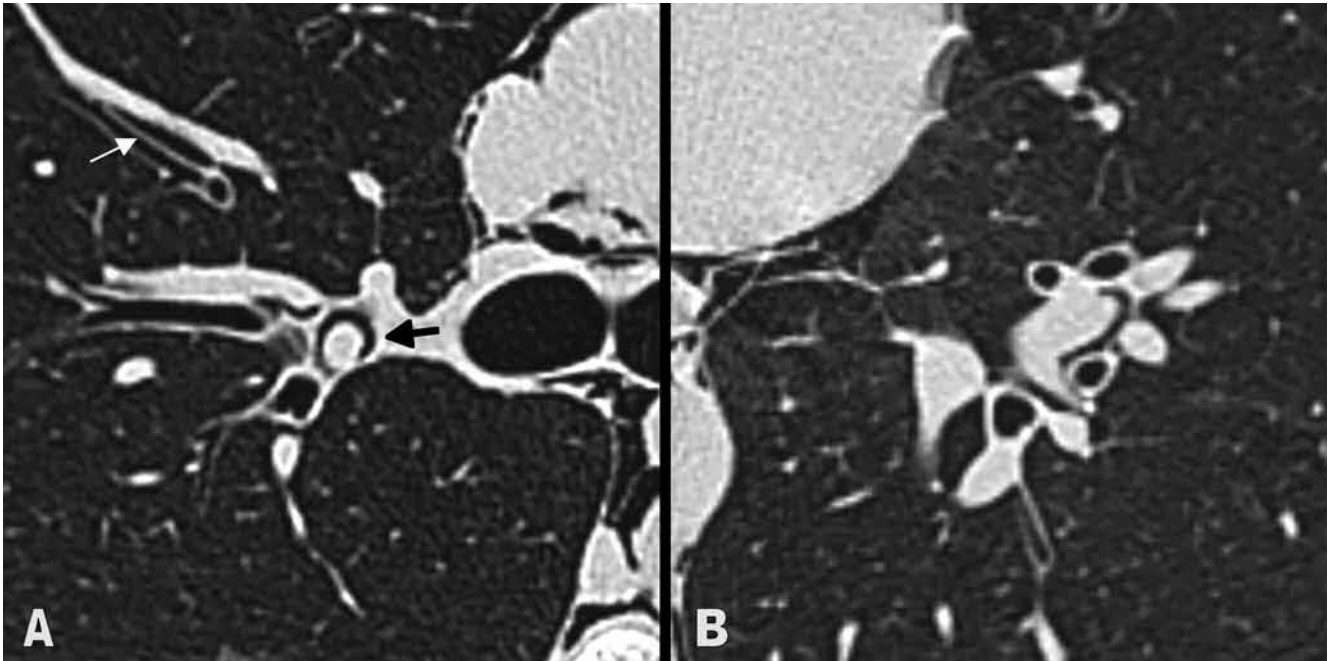


Fig. 3. — Detail of axial CT views shows the “air around the artery” sign (black arrows) with air in the perivascular and peribronchial sheaths, surrounding main branches of pulmonary arteries. These characteristics are pathognomonic findings of pneumomediastinum by Macklin effect when they are found aloof from the hilum.

emphysema, cyst lesions, interstitial disease (2, 4). Secondly, examination of the pleural space is important in such a situation. A pneumothorax is associated in 6% to 30% of cases (4) and represents a potential serious complication of SP. Pleural effusion should be absent in cases of SP because it is more compatible with secondary pneumomediastinum (1).

Finally, we want to point out CT features as indicative of the Macklin effect: free gas collection in the distal parenchyma and interstitial pulmonary emphysema (6, 7) with linear free air collection (aeric density without wall) around the bronchus or the vasculature dissecting the bronchovascular sheaths and spreading into the hilum (Fig. 3-4). To our knowledge, this effect has not yet been described in the case of secondary pneumomediastinum with airway or esophageal rupture and it is specific of a “spontaneous” origin of the pneumomediastinum if the pulmonary parenchyma appears normal. Note that on axial pictures free gas around the vessel can give the ring around the artery sign, but this sign is non-specific of the Macklin effect if found near the hilum.

SP is a benign condition and presence of gas into the interstitium or

into the mediastinum does not affect gas exchanges nor blood gas analysis (8). A pneumothorax is sometimes associated and is often small.

The outcome is usually positive, with resolution of symptoms within a few days. It can be treated expectantly with an admission to the hospital for 2 to 5 days for medical supervision, with reassuring treatment, bed rest, oxygen therapy and analgesics. Re-occurrence is exceptional and out-patient follow-up is usually not necessary.

In conclusion, spontaneous pneumomediastinum is an often missed entity that should be considered in the differential diagnosis of acute chest pain, especially in young adults. We want to point out in particular that the performance of a chest CT in the management of spontaneous pneumomediastinum is important to remind us that the CT appearance of the Macklin effect leads to affirmation of the spontaneous origin of the pneumomediastinum, thus avoiding additional tests for the patient.

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