

Bilateral spontaneous pneumothorax in a non-intubated COVID-19 patient

Obustronna samoistna odma opłucnowa u chorego na COVID-19 niepoddawanego mechanicznej wentylacji

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KEYWORDS:

- COVID
- COVID-19
- SARS-CoV-2
- bilateral spontaneous pneumothorax
- spontaneous pneumothorax
- bilateral pneumothorax
- non-intubated COVID patient

ABSTRACT

Spontaneous bilateral pneumothorax is a rare condition occurring only in 1,3% of cases of spontaneous pneumothorax. Although spontaneous pneumothorax is recognized complication of COVID it is usually associated with severe cases of COVID pneumonia with massive lung involvement and a high level of inflammatory cytokines – so called "inflammatory storm". Large percentage of this patients requires life support with mechanical ventilation and pneumothorax is usually accompanied with pneumomediastinum. Nevertheless occurrence of spontaneous pneumothorax in non-intubated patients is very low. Therefore the presented case is exceptional in two ways – spontaneous pneumothorax occurred in non-intubated patient and is presented bilaterally. Early diagnosis of spontaneous bilateral pneumothorax can pose a diagnostic dilemma as it mimics progression of lung involvement in the course of COVID, pulmonary embolism or myocardial infarction. In our case apart from COVID pneumonia, patient had typical clinical presentation of myocardial infarction and known coronary artery disease, which initially mislead clinicians toward diagnosis of myocardial infarction (MI). However after exclusion of MI, chest radiograph was requested which revealed bilateral pneumothorax. The exact mechanism of pneumothorax development in non-intubated patients is not clear. Lung inflammation in COVID causes formation of pneumatocele, which can predispose to spontaneous pneumothorax. It is important to note that our patient developed pneumothorax without evident pneumatocele, underlying lung condition or history of trauma. This case shows that bilateral pneumothorax in COVID-19 can develop also in patients with only mild clinical course of COVID pneumonia. Early diagnosis and proper management is essential and can prevent life-threatening complications.

SŁOWA KLUCZOWE:

- COVID
- COVID-19
- SARS-CoV-2
- obustronna samoistna odma opłucnowa
- samoistna odma opłucnowa
- obustronna odma opłucnowa
- pacjenci z COVID niepoddawani wentylacji mechanicznej

STRESZCZENIE

Samoistna obustronna odma opłucnowa jest rzadką jednostką chorobową występującą jedynie u 1,3% pacjentów z samoistną odmą opłucnową. Samoistna odma opłucnowa została już opisana jako powikłanie infekcji COVID, jednak jej występowanie wiązano z wysokim stężeniem cytokin prozapalnych – tzw. burzą cytokinową u chorych z ciężkim przebiegu COVID. Duży odsetek wspomnianych chorych wymaga wentylacji mechanicznej – wówczas odma opłucnowa pojawia się najczęściej w mechanizmie barotraumy z towarzyszącą odmą śródpiersiową. Występowanie samoistnej odmy opłucnowej u chorych nie poddawanych mechanicznej wentylacji jest bardzo rzadkie. Opisany przypadek jest zatem wyjątkowy z dwóch powodów – do rozwinięcia odmy opłucnowej doszło u chorej niezaintubowanej, a obserwowana odma była odmą obustronną. Samoistna obustronna odma opłucnowa bywa trudna do rozpoznania, ponieważ może imitować progresję zmian w płucach w przebiegu COVID, zatorowość płucną czy zawał serca. W opisywanym przypadku oprócz zapalenia płuc w przebiegu COVID pacjent miał typowe objawy kliniczne zawału mięśnia serca oraz chorobę wieńcową w wywiadzie, co nakierowało klinicystów na błędne rozpoznanie podejrzenia zawału mięśnia serca. Po wykluczeniu zawału mięśnia serca na podstawie parametrów laboratoryjnych, zlecono radiogram klatki piersiowej, który ujawnił obustronną odmę opłucnową. Mechanizm rozwoju odmy opłucnowej u chorych na COVID nie poddawanych wentylacji mechanicznej nie jest jasny. Zapalenie płuc powoduje tworzenie pneumatoceli, które predysponują do samoistnej odmy opłucnowej. Należy zaznaczyć, że nasz pacjent

rozwinął odmę opłucnową bez współistniejących widocznych w badaniu TK pneumatoceli, przewlekłej choroby płuc bądź historii urazu. Powyższy przypadek ilustruje, iż odma opłucnowa u chorych na COVID może rozwinąć się na każdym etapie w przebiegu choroby, również we wczesnej fazie. Wczesna diagnostyka obrazowa i wdrożenie odpowiedniego postępowania pozwala na uniknięcie groźnych dla życia powikłań.

Introduction

Spontaneous bilateral pneumothorax is a rare condition, occurring only in 1,3% of cases of spontaneous pneumothorax. Risk factors for spontaneous pneumothorax include cigarette smoking, male gender and underlying lung disease – especially emphysema and cystic lung disease. There is a relationship between interstitial pneumonia and spontaneous pneumothorax, however before COVID-19 pandemic it was observed mainly in AIDS patients with pneumocystis carinii infection. In the age of SARS-CoV-2 spontaneous pneumothorax is also seen in patients with COVID pneumonia. In retrospective studies spontaneous pneumothorax occurs in 1% of hospitalized COVID patients and about 2% of COVID patients in ICU (1, 2).

Early diagnosis of spontaneous bilateral pneumothorax can pose a diagnostic dilemma due to its mild clinical presentation initially. In the course of COVID-19 pneumonia, the respiratory distress is usually associated with progression of lung involvement, however it can also be caused by acute COVID complications such as pulmonary embolism or pneumothorax. Detection of this life-threatening entities is crucial, as it dramatically changes patient management and if not early diagnosed can prove to be

fatal. Therefore despite its rare occurrence, spontaneous pneumothorax should be always ruled out in COVID patient with sudden respiratory deterioration, especially in patients in ICU.

Case

78-year old female patient diagnosed with SARS-CoV-2 for 7 days was admitted to the hospital with sudden shortness of breath and tightness of chest. At presentation saturation was 85%. After application of oxygen mask with reservoir with flow rate 5 l/min saturation increased to 98%. Clinical examination showed no abnormalities. Medical history of coronary artery disease and hypertension treated with Ramipril 10 mg since 2010. Laboratory results revealed normal troponin and CK-MB levels. NT-pro BNP was level was 1580 pg/mL (borderline for 78 year old patient). D-dimers level was 1370 ng/ml. Based on clinical and laboratory findings myocardial infarction was excluded and further diagnosis in CXR was requested.

Chest drains were inserted bilaterally, which caused the lungs to decompress. Patient was discharged after 10 days of hospitalization with no complications.



Figure 1. Supine chest radiograph revealed bilateral pneumothorax, more pronounced on the right side. There are peripheral consolidations present bilaterally. Chest CT was requested to further characterize the findings.



Figure 2. Chest CT at lung window confirmed the presence of bilateral pneumothorax. The communication between pleural cavities which would indicate "buffalo pneumothorax" is not present. There is no pneumomediastinum. There are bilateral, peripheral consolidations in keeping with late COVID changes. Based on AI algorithm calculations inflammatory changes occupy only 5% of lung volumes. No pneumatoceles due to COVID, pulmonary emphysema or cystic lung disease are apparent.

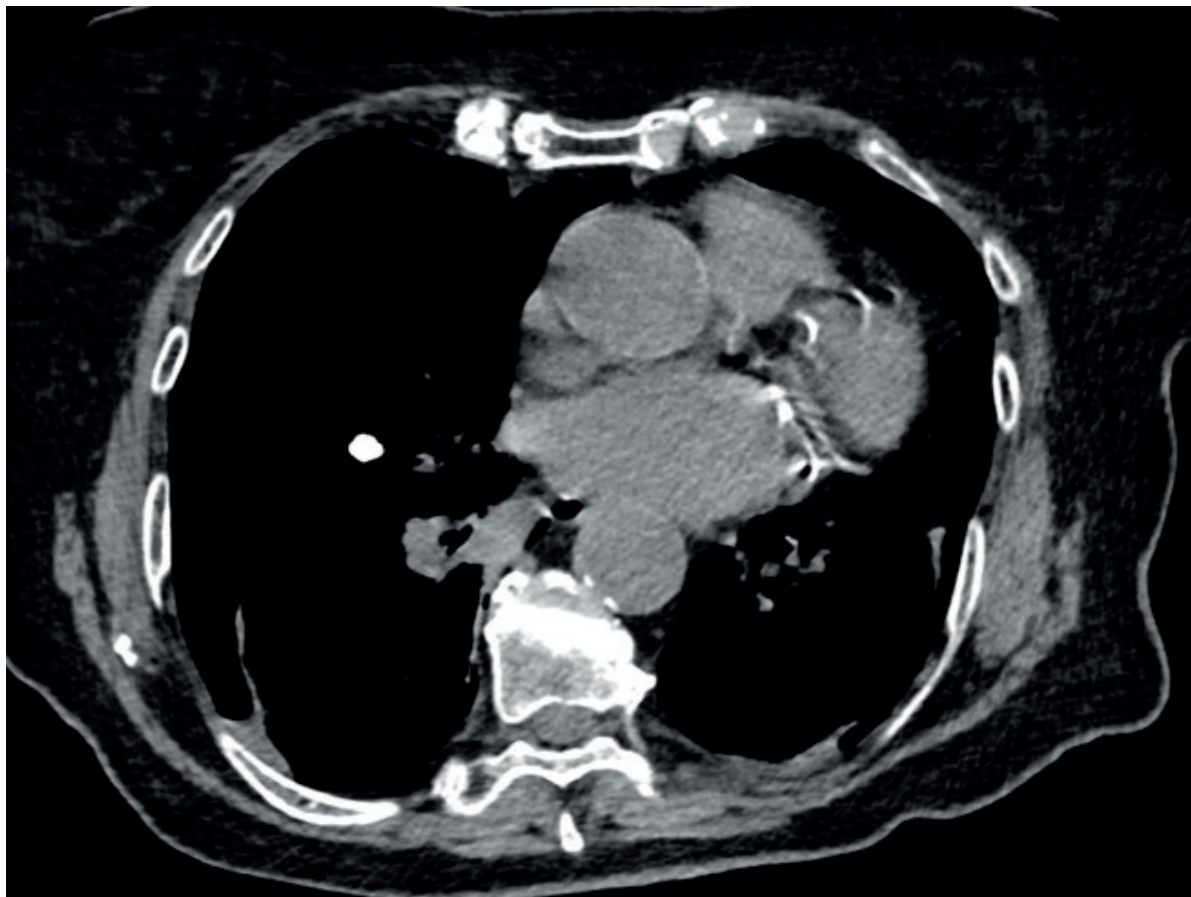


Figure 3. Chest CT at soft tissue window showed severe calcifications in coronary arteries. Although calcified lung nodules and lymph nodes may suggest post tuberculosis changes, there are no cavitation in lungs to support rupture of cavitation causing pneumothorax in this case.

Discussion

The described case is exceptional in two ways – spontaneous pneumothorax occurred in the disease with only mild lung involvement and is presented bilaterally.

Although spontaneous pneumothorax is recognized complication of COVID it is usually associated with severe cases of COVID pneumonia with massive lung involvement and high level of inflammatory cytokines – so called "inflammatory storm". Large percentage of this patients requires life support with mechanical ventilation and pneumothorax is usually accompanied with pneumomediastinum.

The exact mechanism of pneumothorax development in non-intubated patients is not clear. Lung inflammation in COVID causes formation of pneumatocele, which can predispose to spontaneous pneumothorax. There are documented cases of pneumatocele formation as well as its progression and spontaneous rupture in COVID (3). Although formation of pneumatocele is largely facilitated by mechanical ventilation, there are documented cases of spontaneous pneumothorax in patients without mechanical ventilation (4).

In SARS-CoV-1 patients spontaneous pneumothorax was more often reported in patients with neutrophilia, severe lung involvement and grave clinical course (5). However in study on SARS-CoV-2 only high leucocyte count was associated with pneumothorax. Other inflammatory cytokines such as C reactive protein, procalcitonin and D-Dimers did not significantly differ in patients with and without pneumothorax (6). Other study performed on SARS-CoV-2 patients without mechanical ventilation linked pneumothorax only to male gender (4).

It is important to note that our patient developed pneumothorax without evident pneumatocele or underlying lung condition.

Pneumothorax in COVID studies often proves to have grave prognosis (7), especially in older studies of SARS-CoV-1 patients (5, 8). Nevertheless all this studies were conducted on patients on mechanical ventilation, which significantly worsens treatment of pneumothorax. Although there is a very limited data on the prognosis of COVID patients with pneumothorax without mechanical ventilation, available data suggests much better prognosis, with survival rate of 63% (4).

Due to extremely rare occurrence of bilateral pneumothorax in COVID patients without mechanical ventilation, there are no clinical studies to compare our case with.

Bilateral spontaneous pneumothorax can also be the result of unilateral pneumothorax with congenital connection

between pleural cavities causing the air to pass to the contralateral side. This abnormality is often referred to as "buccalo pneumothorax" and has usually worse prognosis than unilateral pneumothorax of the same size.

This case shows that bilateral pneumothorax in COVID-19 can develop also in patients with only mild clinical course of COVID pneumonia. Early diagnosis and proper management is essential and can prevent life-threatening complications.

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