

# Pneumoperitoneum diagnosed as an incidental finding using focus assessed transthoracic echocardiography: a case report

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## Abstract

**Introduction** In this case report we describe how pneumoperitoneum was diagnosed in a patient admitted with acute chest pain, as an incidental finding using focus assessed transthoracic echocardiography (FATE).

**Case report** A 79-year-old male smoker with arterial hypertension was admitted to a coronary unit with a sudden onset of constant left sided thoracic pain. At position 1 (subcostal) of the FATE protocol, the heart and liver could not be visualised. Instead the peritoneum could be seen as a hyperechoic stripe, corresponding horizontal reverberation artefacts was visible under the peritoneal line. Based on these findings, a conventional X-ray image of the abdomen was taken with the patient in the left lateral decubitus position, confirming the diagnosis of pneumoperitoneum.

**Conclusion** This demonstrates how systematic use of FATE combined with knowledge of sonographic patterns in extracardial diseases can directly ensure the patients a quicker diagnosis and treatment.

**Keywords** Pneumoperitoneum · Echocardiography · Point of care ultrasound · Chest pain

## Background

A wide range of extracardial diseases can mimic the symptoms of acute myocardial infarction and it is possible to diagnose many of these diseases using ultrasonography [1–3]. Therefore, it is essential that clinicians using echocardiography become increasingly aware of the sonographic signs in some of these diseases. The typical sonographic signs of pneumoperitoneum is that of increased echogenicity of the peritoneal stripe with corresponding horizontal reverberation artefacts [4–6] (Fig. 1). A similar pattern to the sonographic presentation of pneumothorax [7]. Studies have indicated that ultrasonography is equal or even superior to plain radiography in the diagnosis of pneumoperitoneum [5, 8]. Air in the phrenico-costal sinus or gas in the colon can give the same sonographic pattern and may be misinterpreted as free air in the abdomen. Therefore, it is recommended to change the patient's position from supine to the left lateral decubitus position to confirm the origin of the sonographic pattern [5]. Air in the gastrointestinal tract never overlaps the ventral surface of the liver hence a sonographic pattern of free air at the ventral surface of the liver is diagnostic for pneumoperitoneum [6].

In this case report we describe how pneumoperitoneum was diagnosed in a patient admitted with acute chest pain, as an incidental finding using focus assessed transthoracic echocardiography (FATE) [9]. The FATE protocol consists of set of predefined scanning positions in which the examiner will be able to exclude obvious pathology and assess cardiac dimensions and function. FATE also include pleura scanning.

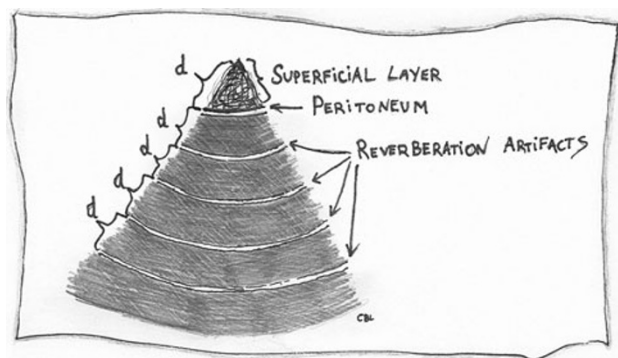
## Case presentation

A 79-year-old male smoker with arterial hypertension was admitted to a coronary unit with a sudden onset of constant

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**Fig. 1** Drawing of the sonographic signs of pneumoperitoneum. The peritoneal stripe is seen as a hyperechoic line just below the superficial layer of skin and abdominal musculature. Corresponding horizontal reverberation artefacts are seen below the peritoneal stripe. The distance (*d*) from the ultrasound probe to the peritoneal stripe, equals the distance between the reverberation artefacts

left sided thoracic pain. The pain radiated to the back and the left shoulder, it worsened with movement and cough. During the transport to the hospital the patient received oxygen, oral nitro-glycerine and aspirin with some effect on the pain. At the arrival to the coronary unit, he was found in acute pain. The respiratory and heart rate was increased. Blood pressure, saturation, temperature and heart and lung auscultation were normal. On examination of the abdomen, the patient did not complain of any pains. There was no guarding and few abdominal sounds. The ECG showed sinus rhythm and no signs of heart ischemia. Treatment with low molecular heparin and clopidogrel was initiated on the suspicion of acute myocardial infarction.

Two hour later, the patient was reexamined. The patient now had slight pain when he was palpated in the upper left quadrant of the abdomen. Still no guarding was present. The available blood tests showed an elevated total white blood

cell count ( $22.5 \times 10^9/l$ ), thrombocytosis ( $516 \times 10^9/l$ ), slight anaemia (6.5 mmol/l) and elevated carbamide (13.4 mmol/l). C reactive protein, creatinine, potassium, sodium, amylase and troponine T all showed normal values.

As a part of the secondary evaluation FATE including ultrasonographic examination of the pleura and lungs was performed. At position 1 (subcostal), the heart and liver could not be visualised. Instead the peritoneum could be seen as a hyperechoic stripe, corresponding horizontal reverberation artefacts was visible under the peritoneal line (Fig. 2). At position 2 and 3 (apical and parasternal) of the FATE protocol, the heart could be visualised. There was no pericardial effusion or other signs of pathology. Chamber dimensions were normal. The left ventricle was well filled and the ejection fraction was judged to be normal. Sonographic examination of the lungs and pleura, showed normal lung sliding, no B-lines, periphery alveolar consolidation, atelectasis or effusion.

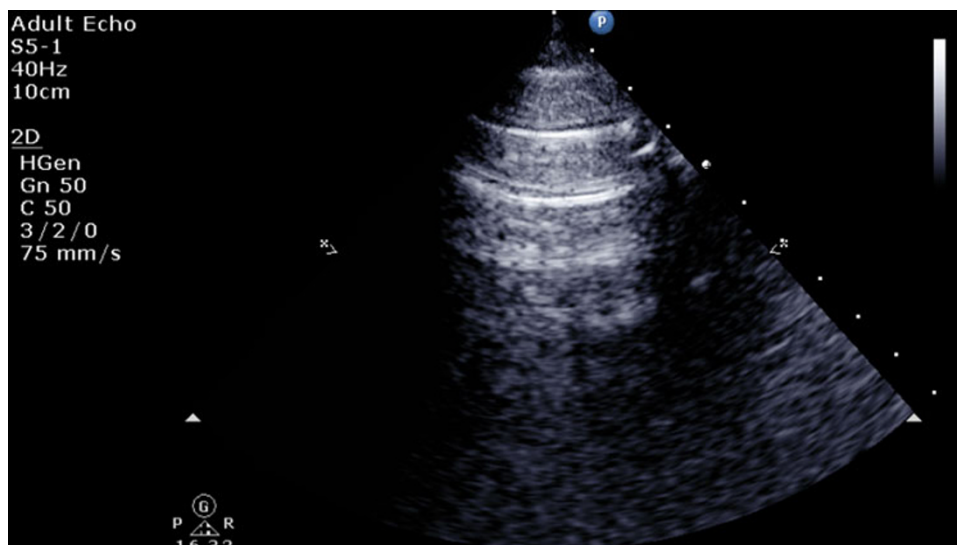
Based on the findings from the subcostal view, a conventional X-ray image of the abdomen with the patient in the left lateral decubitus position was taken. The X-ray confirmed the diagnosis of pneumoperitoneum. The patient was transferred to a surgical unit where he was operated for a perforated ventricular ulcer.

## Discussion

The routine use of simple protocolised ultrasonographic examinations are already widely used in trauma and intensive care. These principles can easily be transferred to a wider patient population, including the patients who are acute admitted to a medical ward.

If a patient is admitted with abdominal trauma, a part of the initial evaluation would be focused assessment with

**Fig. 2** The sonographic appearance at the subcostal window of the focus assessed transthoracic echocardiography (FATE), the heart and liver cannot be visualised. The peritoneum is seen as a hyperechoic stripe, corresponding horizontal reverberation artefacts are visible under the peritoneal line



sonography for trauma (FAST) [10]. The FAST principles can be transferred to some types of medical patients.

In this case the initial physician was deceived by the fact that the patient did not have the typical symptoms and signs of a perforated ventricular ulcer, but instead presented with acute chest pain. As a part of the secondary evaluation of the patient, a FATE was performed. The intention was to diagnose or exclude obvious cardiac and pulmonary/pleural pathology. Instead, as an incidental finding, it gave the diagnosis of pneumoperitoneum. Had the patient not been examined with FATE, the correct diagnosis and treatment would probably had been delayed for several hours since the patient had not yet developed the classical signs of a perforated ventricular ulcer.

The symptoms and signs of acute admitted patients do not always fit in with the text book example, thus deceiving the physician into making a wrong diagnosis and thereby delaying correct treatment and even harm the patient with a wrong treatment. As our case demonstrates the routine use of a simple protocolised ultrasonographic examination can help the physician to make the correct diagnosis at bedside.

## Conclusion

This case demonstrates how systematic use of FATE in acute medical patients combined with knowledge of sonographic patterns in extracardial diseases can directly ensure the patients a quicker diagnosis and treatment.

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

images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

**Conflict of interest** None.

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