

## Black Pleural Effusion: When Lung White(out) Turns Black

An 80-year-old female presented to the Emergency Department with two weeks' duration of dyspnoea, loss of voice and weight loss. She denied fever, night sweats, gastrointestinal or joint symptoms. She also did not have ocular symptoms such as flashes, floaters or visual field defects. Significant medical history included diabetes mellitus, hypertension, hyperlipidaemia, osteoporosis, and early dementia. On arrival, tympanic temperature was 36.8°C, blood pressure was 87/60mmHg, heart rate was 60/min and oxygen saturation was 98% on room air. Physical examination revealed stony dullness percussion note associated with reduced air entry of the left hemi-thorax. There are no naevi noted on the patient's body or conjunctiva. Chest radiograph showed a complete whiteout of the left hemithorax with mediastinal shift to the contralateral side (Figure 1 Panel A). Computed tomography (CT) scan of the thorax, abdomen and pelvis showed a massive left effusion with mediastinal compression, as well as a gastric fundal mass (Figure 1 Panel B). Bedside thoracostomy drained 1.5 litres of black pleural effusion (Figure 2). Pleural fluid study

showed a pleural:serum haematocrit ratio of 65%. Haemoglobin level was 8.3g/dL (11.4 g/dL prior to admission), total white cell count was  $13.1 \times 10^9/L$  and platelet count was  $504 \times 10^9/L$ . C-reactive protein (CRP) and procalcitonin levels were 141.3mg/dL and 0.08ug/L, respectively. Renal and liver function tests were unremarkable. There was no suggestion of haemolysis in the peripheral blood. Pleural fluid biochemistry was not feasible due to haemolysis. Preliminary pleural fluid microbiology did not show any organisms on gram stain and acid-fast bacilli smear. Pleural cytology showed atypical cells with enlarged and eccentric nuclei.

What are the possible differentials that could cause this appearance?

- A. Pancreatico-pleural fistula
- B. Oesophageal perforation
- C. Haemorrhagic malignant pleural effusion
- D. Fungal pleural infection
- E. Pseudochylothorax



Figure 1 Panel A. Chest radiograph of the patient with complete whiteout of the left lung and mediastinal shift to the contralateral side.



Figure 1 Panel B. Large left pleural effusion (black arrow) and a gastric fundal mass (white arrow) on the CT scan.

Answer: C



Figure 2. Black pleural effusion obtained after thoracentesis.

## Discussion

Pleural effusion is commonly encountered in clinical practice. What is often overlooked is the appearance of the pleural effusion, which can give ample information about the nature of the effusion. Black pleural effusions are rare, with only 21 cases being described in the literature. Reported causes of black pleural effusion were: (1) malignancy (metastatic melanoma [n=5], lung carcinoma [n=2] and metastatic prostate carcinoma [n=1]); (2) pancreatico-pleural fistula [n=5]; (3) fungal infection (*Aspergillus niger* [n=2] and *Rhizopus oryzae* [n=1]); (4) miscellaneous causes (crack cocaine use [n=2], mediastinal teratoma [n=1], rheumatoid pleurisy [n=1], and charcoal-containing empyema [n=1]).

The black pigmentation has been attributed to necrotic debris (e.g. in pleural infections), melanin (e.g. in malignant melanoma), bilirubin (e.g. in bile duct or pancreatico-pleural fistula) or discolouration due to foreign material (e.g. in charcoal-containing empyema where activated charcoal leaks into the pleural space through an oesophageal tear).

In this case, the diagnosis is malignant haemorrhagic pleural effusion. The subacute nature of the symptoms suggested an indolent process such as a malignancy. The loss of voice was most likely due to left vocal cord

paresis as a result of malignant involvement, or stretch of the recurrent laryngeal nerve due to mediastinal shift. The black discolouration of the pleural fluid was a result of intrapleural haemolysis and most likely the presence of haemosiderin-laden macrophages following distant bleeding into the pleural cavity due to metastatic adenocarcinoma, as previously described by Jayakrishnan et al. In addition to a large left pleural effusion, CT imaging showed the presence of an irregular contrast-enhanced gastric fundal mass, which is most likely a malignant growth (Figures 1 and 3). However, our patient declined further endoscopic evaluation. A repeat pleural fluid cytology sample revealed abnormal cells with vacuolated cytoplasm consistent with metastatic adenocarcinoma; immunohistochemistry was inconclusive for the site of the primary tumour. (Results were positive for BER-EP4, CK7, with faint nuclear staining for TTF-1 seen in rare cells; negative for calretinin, podoplanin, CK20, Pax-8, Gata-3 and ER). In our patient, a malignancy of extrapulmonary origin was the more likely diagnosis, given the clinical scenario of a gastric fundal mass.

Pleural effusion due to a pancreatico-pleural fistula (option A) usually affects the left pleural cavity and this is mostly a complication of pancreatitis, which is again unlikely due to the absence of gastrointestinal symptoms, normal serum amylase and normal pancreas appearance on CT (Figure 3).

The absence of retching or gastrointestinal procedure, and lack of ingestion of pigmented food product or medicine (e.g. activated charcoal) made option B unlikely. Fungal infection in the pleural space (option D) is exceedingly rare and unlikely to occur without underlying immunosuppression or prior pleural instrumentation.

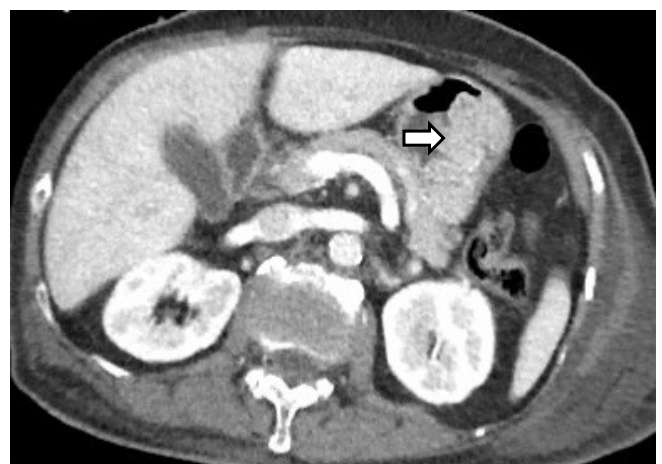


Figure 3. Transverse section of the CT scan of the abdomen showing a gastric fundal mass (white arrow) and normal pancreas.

Pseudochylothorax (option E), also known as cholesterol pleurisy, is associated with tuberculous or rheumatoid pleurisy. The pleural effusion is rich in cholesterol and does not contain triglycerides or chylomicrons. This would give the effusion a whitish or café-au-lait colour, instead of a black appearance.

### Conclusion

While black pleural effusion is rarely encountered in clinical practice, it is associated with an underlying sinister disease, and malignancy should not be overlooked.

### REFERENCES

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