¹Oxford Centre for Respiratory Medicine, Churchill Hospital, Oxford OX3 7LJ

²Radiology Department, Churchill Hospital

Correspondence to: F V Gleeson fergus.gleeson@clinical-medicine.oxford.ac.uk

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RATIONAL IMAGING

Investigating suspected malignant pleural effusion

N M Rahman¹, R J O Davies¹, F V Gleeson²

This series provides an update on the best use of different imaging methods for common or important clinical presentations

The patient

A 77 year old man presented with a three week history of progressive dyspnoea, associated with a cough productive of white sputum and left sided chest pain. He had no medical history of note, although he was an ex-smoker of 40 pack years. He had previously worked as an engineer but had no known history of exposure to asbestos. Examination was consistent with a large left sided pleural effusion, confirmed on a posteroanterior chest radiograph.

He had a diagnostic and therapeutic pleural aspiration, at which 750 ml of straw coloured pleural fluid was removed and samples were sent for biochemical, cytological, and microbiological analysis. The fluid was an exudate—protein concentration 50 g/l (>30 g/l suggests an exudate), lactate dehydro-

genase 134 IU/l (more than two thirds of blood normal range suggests an exudate, >200 IU/l for our institution)—with negative microbiology. Fluid cytology was negative for malignancy, and glucose concentration was normal (4.2 mmol/l).

What should be the next investigation?

A clear diagnosis for the cause of the effusion needs to be established. Initial investigations suggested an exudative effusion on biochemical criteria, with a wide differential diagnosis. In the presence of a pleural effusion occupying more than a half to two thirds of the hemithorax, malignancies such as metastatic disease—usually from an adenocarcinoma of the lung, an extrathoracic primary site, or a mesothelioma—are the most likely diagnoses. Treatment options depend on the histology. Exclusion of mesothelioma is important owing to specific associated management concerns, such as chemotherapy, compensation, and radiotherapy to the biopsy and drain tracts to prevent seeding of the tumour.

Repeat pleural aspiration—Pleural aspiration has a sensitivity of 60% for pleural malignancy after a single attempt. A single repeat aspiration may be considered but is only helpful in an additional 10% of cases.¹ Pleural aspiration has a poor yield (30%) in mesothelioma.

Thoracic ultrasonography—Ultrasonography is commonly used to confirm the presence of a pleural effusion and is useful to identify a site for fluid aspiration or drainage, particularly for small pleural effusions. Little information is available on its use in identifying the cause of undiagnosed effusions.

Computed tomography of the chest and abdomen—Computed tomography allows the pleura to be assessed and potentially causative abnormalities of pleural effusions such as lung carcinoma and abdominal malignancy to be identified. Identification of pleural nodularity, and mediastinal and parietal pleural thickening, by computed tomography has a high sensitivity (approximately 90%) for malignancy.² To ensure optimum diagnostic utility, the imaging must be done before complete pleural fluid drainage.² Computed tomography also determines the appropriate diagnostic strategy. In the presence of pleural thickening, image guided biopsy has a higher diagnostic yield for malignant disease (87% sensitivity, 100% specificity)

LEARNING POINTS

Large unilateral pleural effusions are most often caused by malignancy; diagnostic pleural aspiration has a sensitivity of 60% for malignancy

If pleural fluid cytology is negative, computed tomography of the chest should be done before the effusion is drained; this has a high sensitivity for malignant pleural disease

Pleural fluid should initially be drained only for symptomatic relief; leaving some fluid in the pleural cavity allows the choice of a safe image guided biopsy or thoracoscopy

Computed tomography guided biopsy and thoracoscopy (which can be done under conscious sedation by a physician) have high diagnostic yields for malignant pleural disease

Computed tomography guided biopsy should be used when pleural thickening is present, with only a small volume of pleural fluid, or when thoracoscopy is not available

Thoracoscopy should be used when a substantial amount of pleural fluid remains, if no nodularity is identified on chest computed tomography, and where both a diagnosis and a therapeutic procedure (talc pleurodesis) are needed

The series editors are Fergus Gleeson, consultant radiologist, Churchill Hospital, Oxford, and Kamini Patel, consultant radiologist, Homerton University Hospital, London

Contrast Enhanced computed tomography of the chest (top) shows a large left pleural effusion and small loculated right pleural effusion (arrowheads) and nodular pleural metastases (arrows). Contrast enhanced computed tomography of the upper abdomen (bottom) shows a right renal mass (arrowed) and the left sided pleural effusion (arrowed), which has inverted the diaphragm as a result of its large volume.

USEFUL READING

- BTS guidelines for the management of pleural disease. *Thorax* 2003;58(suppl 2):ii1-59
- Clinics in chest medicine. *Pleural Disease* 2006;27:193-355

than does “blind” pleural biopsy with an Abram’s needle (47% sensitivity).³ If only a small volume pleural effusion is present, image guided biopsy is the technique of choice, as entering the pleural space for other diagnostic techniques is potentially hazardous.

Closed blind pleural biopsy—Closed blind pleural biopsy (for example, using an Abram’s needle) is not recommended, as its sensitivity for malignancy is less than that of image guided pleural biopsy or thoracoscopy^{3 4} and it does not allow treatment of the pleural effusion. For areas in which tuberculosis is endemic and pleural effusion is likely to be caused by tuberculosis, closed pleural biopsy is a reasonable investigation with a high diagnostic rate (combined culture and histology sensitivity of 79%).⁵ However, if it is available, medical thoracoscopy has been shown to have a higher sensitivity (approaching 100%) in a prospective trial comparing the two techniques.⁵

Thoracoscopy—Thoracoscopy is now becoming more widely available and is done by a physician with the patient under conscious sedation. It should be considered in patients with a probable malignant pleural effusion who need pleurodesis. It is also a valuable diagnostic technique when computed tomography does not identify evidence of malignancy. Its diagnostic rate is comparable to that of image guided biopsy, and it achieves diagnosis, drainage, and pleurodesis in a single procedure.⁴

Outcome

The patient had contrast enhanced thoracic computed tomography, which showed a large left pleural effusion associated with nodularity consistent with malignant pleural disease (figure). In addition, an associated right renal mass was seen, suggesting a diagnosis of metastatic renal carcinoma. As substantial pleural fluid remained, he proceeded to medical thoracoscopy, at which a diffuse pleural abnormality was seen (see video on bmj.com). Multiple pleural biopsies were taken, the pleural space was fully drained, and a talc poudrage pleurodesis was done. The biopsies confirmed the diagnosis of renal cell carcinoma, and the patient was referred for consideration for chemotherapy.

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- 1 Maskell NA, Butland RJA. BTS guidelines for the investigation of a unilateral pleural effusion in adults. *Thorax* 2003;58(suppl 2):ii8-17.
- 2 Traill ZC, Davies RJO, Gleeson FV. Thoracic computed tomography in patients with suspected malignant effusions. *Clin Radiol* 2001;56:193-6.
- 3 Maskell NA, Gleeson FV, Davies RJO. Standard pleural biopsy versus CT guided cutting needle biopsy for diagnosis of malignant disease in pleural effusions: a randomised controlled trial. *Lancet* 2003;361:1326-30.
- 4 Ferrer J, Roldan J, Teixidor J, Pallisa E, Gich I, Morell F. Predictors of pleural malignancy in patients with pleural effusion undergoing thoracoscopy. *Chest* 2005;127:1017-22.
- 5 Diacon AH, Van de Wal BW, Wyser C, Smedema JP, Bezuidenhout J, Bolliger CT, et al. Diagnostic tools in tuberculous pleurisy: a direct comparative study. *Eur Respir J* 2003;22:589-91.

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