Pleural Plaques: Appearances, Mimics and Clinical implications

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Learning objectives

To be able to:

1. Recognise the various appearances of pleural plaques

2. Recognise the mimics of pleural plaques

3. Differentiate simple pleural plaques from diffuse pleural thickening and malignant lesions on a chest radiograph

4. Understand the options for imaging pleural plaques

5. Be aware of the current medico-legal implications of pleural plaques
Background

Pleural plaques are the commonest radiographic manifestation of, and are virtually pathognomonic for, asbestos exposure. The formation of pleural plaques can occur after relatively limited exposure to asbestos, which is in contrast to the greater exposure which is required to cause parenchymal lung disease.

The plaques are areas of fibrosis, affecting mainly the parietal pleura, which are thought to form secondary to an inflammatory reaction to fibres that reach the pleura via the lymphatic system. The time lag between exposure to asbestos and appearance of pleural plaques is approximately 20 to 30 years and they are therefore still widely encountered and are a relatively common finding on routine chest radiographs.

Pleural plaques vary in size, number and location from patient to patient and this creates a wide spectrum of imaging findings. There are however a number of characteristic appearances and knowledge of how these differ from other types of asbestos related pleural disease is vital for both the specialist and general radiologist.

In the majority of cases the diagnosis of pleural plaques can be achieved using a simple chest x-ray. However CT can be used in more difficult cases and to increase the accuracy of the diagnosis. There is also a potential role for other imaging techniques such as tomosynthesis. This technique can confirm the diagnosis with potentially less radiation exposure than a CT scan of the thorax.

Medicolegal implications

In the United Kingdom there is currently disparity in the medico-legal implications of the presence of pleural plaques. Prior to 2007 patients were able to pursue a civil claim for compensation. However, in October 2007 the House of Lords produced a ruling ending this right to claim. Subsequent campaigns in Scotland resulted in the introduction of the Damages (Asbestos Related Conditions) Act 2009. This act allowed civil claims for pleural plaques to recommence but only in Scotland. The governments of England and Wales chose not to follow this example but the Northern Ireland Assembly did and introduced their own bill giving people the right to claim. The claimant must however submit the claim within three years of the date they first became aware that they have an asbestos-related condition.

Therefore in England and Wales patients can only claim for compensation if they have proven asbestosis, diffuse pleural thickening, mesothelioma or lung cancer accompanied
by asbestosis or bilateral diffuse pleural thickening. The only caveat to that is if the person was working in Scotland or Northern Ireland during the time of the asbestos exposure they are still able to claim for compensation even if the eventual diagnosis was made whilst they were living in England or Wales.

Globally there is no consensus of opinion regarding the legal right to claim for the presence of pleural plaques. The government of each individual country decides whether there is a case for compensation and indeed whether the state or the individual company who employed the patient at the time of exposure is liable if a claim is successful.
Imaging findings OR Procedure details

Classic plaque appearances

- If calcified (only 10-15%) they are well defined, often bilateral with an irregular outline (can resemble a holly leaf when seen en face): Fig. 1 on page 7
- Non-calcified plaques are more difficult to identify on plain films but are most readily identified if they lie on the lateral chest wall
- CT readily identifies both calcified and non-calcified plaques: Fig. 2 on page 7, Fig. 3 on page 8

Classic plaque distribution

- Postero-lateral chest wall between the seventh and tenth ribs
- Lateral chest wall between the sixth and ninth ribs
- Dome of the diaphragm: Fig. 2 on page 7
- Mediastinal pleura: Fig. 4 on page 9
- Typically absent from costophrenic angles and apices: Fig. 5 on page 10

Atypical appearances

Visceral pleural plaques

- can arise in fissures: Fig. 6 on page 11
- often associated with underlying parenchymal distortion (hairy plaques): Fig. 7 on page 12

Examples to highlight the differences between plaques, diffuse pleural thickening and mesothelioma

Diffuse pleural thickening: Fig. 8 on page 13

- Forms following resolution of benign asbestos-related pleural effusion - however, can occur following other causes of exudative effusions
- A smooth continuous sheet of pleural thickening extending over at least one-quarter of the chest wall
- Can often involve the costophrenic angles and apices,
- Rarely calcifies
Mesothelioma: Fig. 9 on page 13

- Pleural thickening which becomes progressively more lobulated
- Loss of volume of the affected hemithorax
- Often an associated effusion
- Tumour spread into interlobar fissures and onto mediastinal surface
- Tumour can directly extend through chest wall and diaphragm

**Mimics of pleural plaques**

There are a number of conditions or normal anatomical structures which can mimic pleural plaques particularly on a chest x-ray. Knowledge of these potential mimics helps to differentiate them from pleural plaques and directs correct further investigation usually with CT.

Normal anatomical structures

- Pleural fat: Fig. 10 on page 14
- Rib fractures
- Companion shadows for ribs
- Intercostal veins on CT: Fig. 11 on page 14

Pathological mimics

- Pleural based lesions: Fig. 12 on page 15 - loculated effusion, fibroma, inflammatory mass Fig. 13 on page 16, pleural metastases
Images for this section:

Fig. 1: Box highlighting plaque with a classic hollyleaf appearance

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Fig. 2: Fig 2a. Arrows indicating classic CXR appearance of right sided pleural plaque and calcification of the left hemidiaphragm Fig 2b. Classic axial CT appearance of a calcified pleural plaque

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Fig. 3: Arrows indicating non calcified pleural plaques easily displayed on CT

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Fig. 4: Arrows indicating mediastinal calcified plaque

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Fig. 5: Boxes highlighting sparing of apical and costophrenic angles in patient with widespread pleural plaques

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Fig. 6: Arrows indicating fissural plaques on HRCT

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Fig. 7: Visceral plaque with underlying parenchymal distortion (hairy plaque)

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Fig. 8: Arrows indicating the classic appearances of diffuse pleural thickening in fig 8a on CXR and in fig 8b on CT

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**Fig. 9:*** CXR on left displaying right sided mesothelioma with circumferential pleural thickening and loss of volume. CXR on right displaying a more advanced mesothelioma with lobulated appearance in the left hemithorax.

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**Fig. 10:** Arrows indicating the appearances of extrapleural fat on CXR and CT

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Fig. 11: Arrows indicating intercostal veins

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Fig. 12: Left sided pleural mass

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**Fig. 13:** Same patient as in Fig 11. CT reveals a pleural based inflammatory mass secondary to retained portion of a previously inserted intercostal drain

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Conclusion

The identification of pleural plaques has important implications for many patients. They not only signify previous asbestos exposure but could also mean the patient could claim compensation depending upon in which country the asbestos exposure took place.

The ability to recognise pleural plaques on plain films and differentiate them from other asbestos related conditions, as well as those conditions which mimic the appearances of pleural plaques, is an important skill for any radiologist. Further clarification with alternative imaging may be required in certain circumstances.
References


