Calcification on the chest X-ray: a pictorial review

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There are numerous causes of calcification on the chest radiograph. Their striking appearance can lead to anxiety among junior medical staff. This article aims to categorize these appearances, and to give examples of the most common causes seen.

The disease processes that result in calcification are usually chronic or slowly progressive, and this may be confirmed by a review of previous chest radiographs. Although calcification is less relevant in the assessment and management of acutely ill patients, it can give important information about previous medical history.

Calcified lesions may be divided into nodules, pleural calcification or calcification within lymph nodes (*Table 1*). Occasionally, a soft tissue mass may have associated calcific elements. This article will discuss the common examples of each of these appearances.

NODULES

Tuberculosis

Primary tuberculosis (TB) is characterized by a small area of peripheral consolidation (Ghon focus) and hilar lymphadenopathy which can later calcify. The classical appearance of active post primary TB is of irregular, patchy consolidation in the apical bronchopulmonary segments of either lung. These areas may subsequently cavitate, and healing occurs with fibrosis; the appearances of apical fibrosis in TB are of linear streaky shadowing with hilar elevation as a result of volume loss. An alternative manifestation is of tuberculous empyema which appears as a peripheral, pleurally-based area of amorphous calcification (*Figure 1*). Although such changes may resemble those changes seen after asbestos exposure, they are unilateral, and occur in the absence of other features of asbestos disease. Other features of TB exposure include surgical manifestations such as thoracoplasty (*Figure 2*), plombage and phrenic nerve crush (Grainger et al, 1997).

Varicella pneumonia

Varicella pneumonia in the acute phase has the appearance of small focal patches of consolidation. Calcified nodules with diameters of 1–3 mm ensue in 2% of cases, normally in the mid- and lower zones (*Figure 3*), and usually take several years to develop after the acute infection has resolved (Sutton, 1993).

TABLE 1.
Sites of calcification for different diseases

	Site of calcification				
Disease process	Hilar	Parenchymal	Pleural	Extrapulmonary	Size
Tuberculosis	Yes	Yes	Yes	No	Variable
Varicella	No	Mid- and lower zones	No	No	1–3 mm
Asbestos	No	No	Yes	No	Holly leaf
Mitral valve disease	No	Mid- and lower zones	No	Yes, mitral valve annulus	<8 mm
Haemothorax	No	No	Yes	No	Variable
Sarcoid	Yes	No	No	No	Eggshell
Silicosis	Yes	Yes	No	No	1–3 mm
Harmatoma	No	Yes	No	No	Popcorn, variable

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Mitral valve disease

Multiple areas of increased density may be caused by pulmonary haemosiderosis as a result of chronic pulmonary venous hypertension. These areas are up to 8 mm in diameter and are usually seen in the mid- and lower zones. They may demonstrate ossification. These changes occur particularly in conjunction with mitral stenosis. The chest X-ray may also demonstrate other signs of mitral valve disease, which include calcification of the mitral valve annulus (*Figure 4*), left atrial enlargement, cardiomegaly or evidence of cardiac failure (Woolley and Stark, 1999).

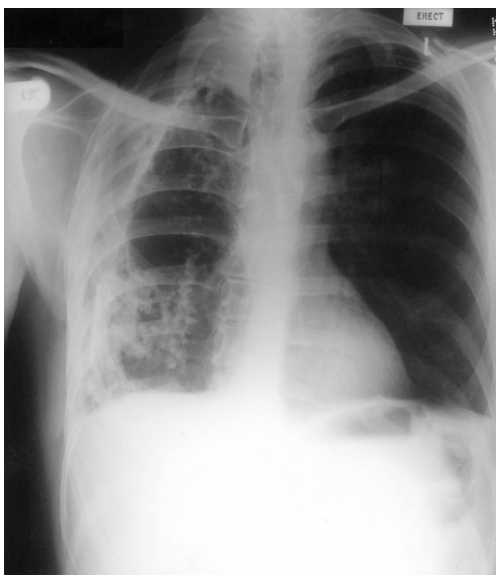

Figure 1. Pleural thickening and calcification in previous tuberculous empyema.

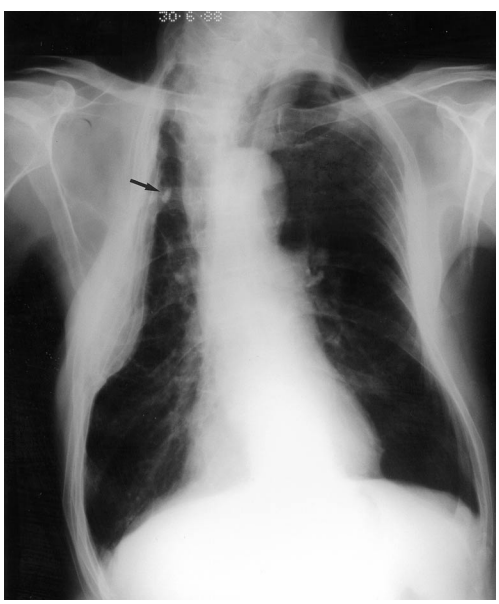

Figure 2. Thoracoplasty and calcified tuberculoma (black arrow) at right apex.

PLEURAL DISEASE

Asbestos-related lung disease

Exposure to asbestos gives rise to a number of pleurally-based manifestations (Goddard, 1987). These include pleural plaques (*Figure 5*), diffuse pleural thickening, pleural effusions and malignant mesothelioma. Pleural plaques tend to calcify and are said to be 'holly leaf' in outline when seen en face. Plaques usually occur in the

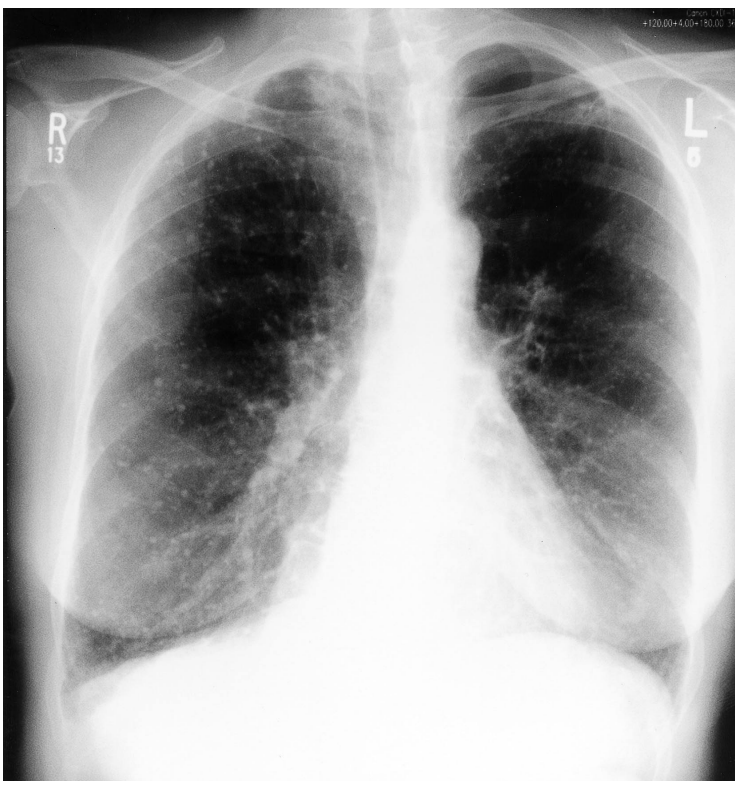

Figure 3. Widespread miliary calcified nodules pathognomonic of previous varicella pneumonia.

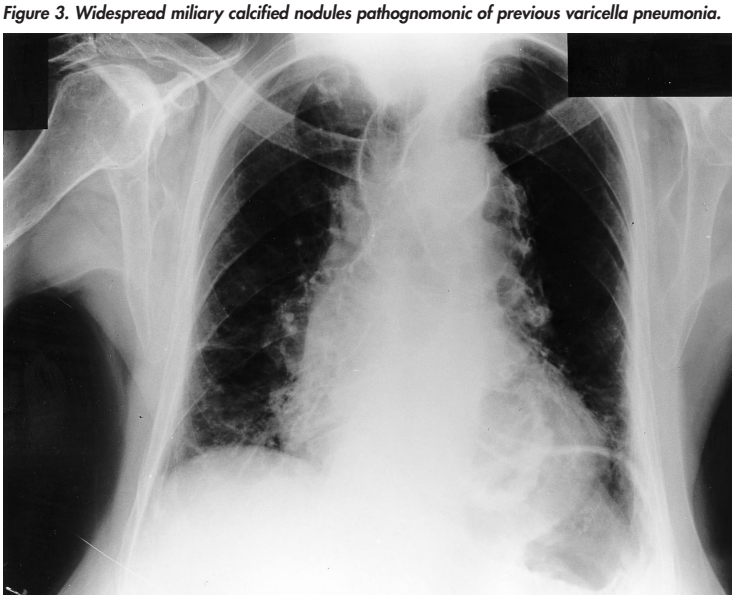

Figure 4. Calcification of the mitral valve annulus and venous congestion in mitral valve disease.

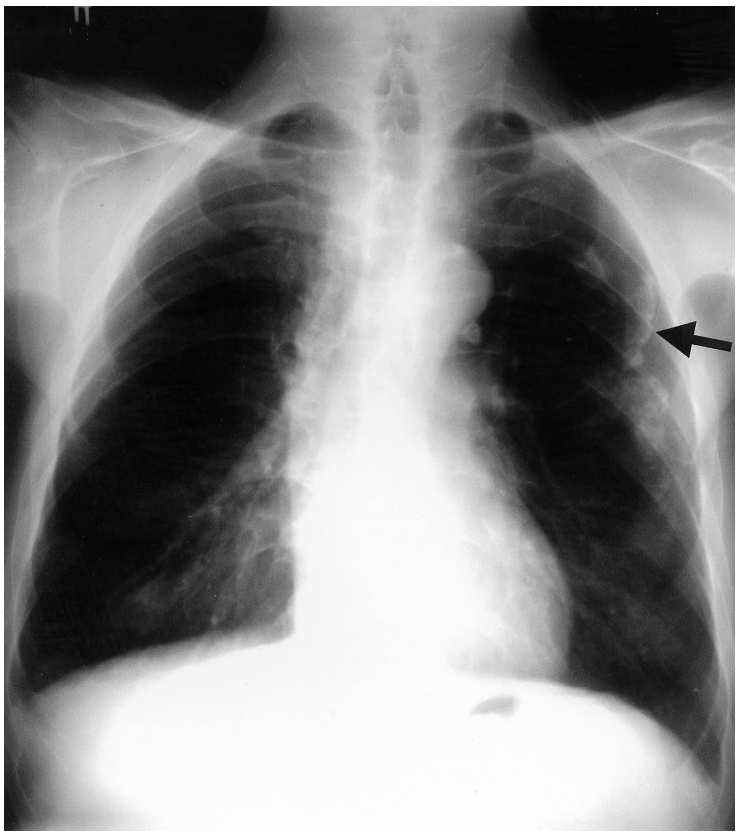

Figure 5. Calcified pleural plaques (black arrow) following asbestos exposure.

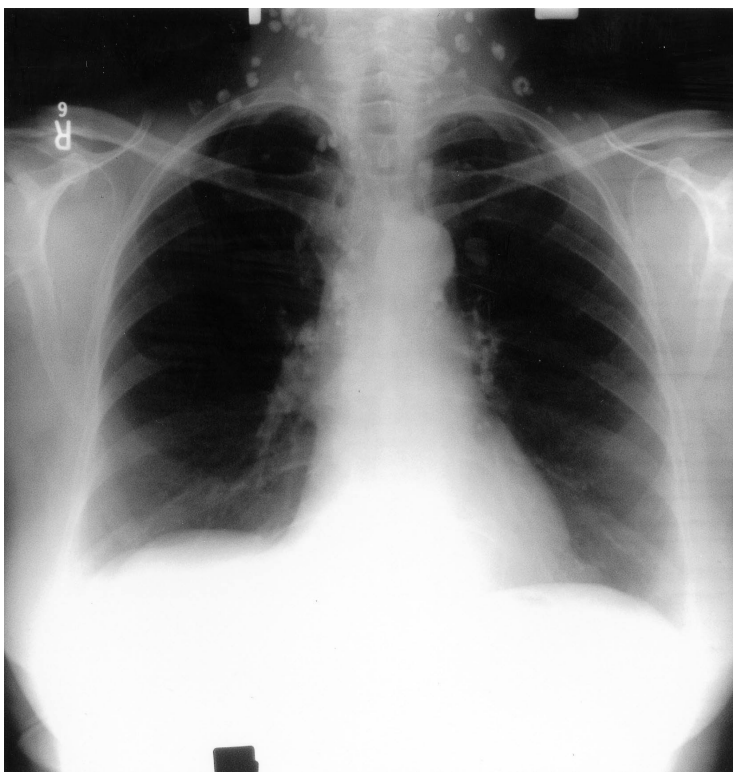

Figure 6. Multiple 'eggshell' calcified hilar lymph nodes and calcified cervical lymph nodes in either sarcoidosis or previous tuberculosis.

mid-zones or overlying the hemi-diaphragms. These changes may be associated with interstitial lung disease, i.e. asbestosis.

Previous haemothorax/empyema

Haemorrhage or infection within the pleural cavity may calcify (*Figure 1*).

CALCIFICATION OF LYMPH NODES

Sarcoid

Sarcoid gives a great variety of chest X-ray appearances, ranging from the classical bilateral hilar lymphadenopathy, to upper zone fibrotic change (Gawne-Cain and Hansell, 1996). In approximately 5% of cases, bilateral eggshell calcification occurs as fine rims of calcific density at both hila (*Figure 6*).

Silicosis

This condition can give the same upper zone fibrotic change and peripheral eggshell calcification of mediastinal lymph nodes that occurs in sarcoid (*Figure 7*). It can also result in widespread dense nodular change (Fraser et al, 1990). An occupational history is essential.

CALCIFIED MASSES

Hamartoma

The most commonly occurring soft tissue mass with associated calcification is the benign hamartoma (*Figure 8*). These tend to occur in peripheral locations, and their calcification has been described as 'popcorn' in its pattern.

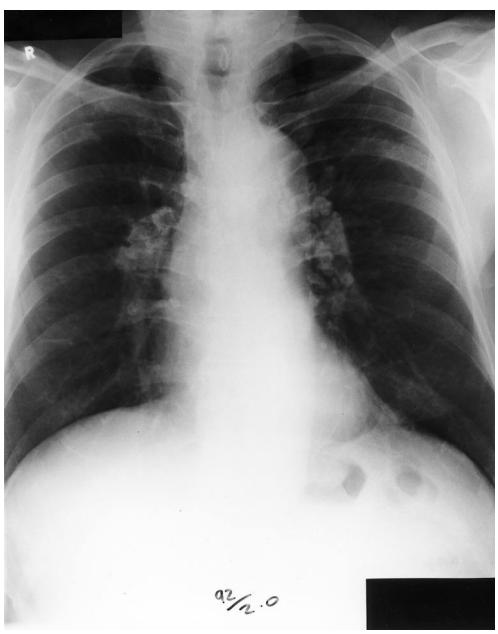

Figure 7. Bilateral eggshell calcification of hilar nodes in silicosis.

Hamartomas often contain fat, and its demonstration on computed tomography confirms this diagnosis (Sutton, 1993). Only rarely do other bronchogenic tumours calcify and if they do, it is usually within a calcified area from previous TB.

CONCLUSION

This pictorial review aims to summarize the common causes of calcification on the chest radiograph as encountered in daily hospital medical practice and to offer likely differential diagnoses. The majority of conditions are readily diagnosed by careful assessment of all the radiological signs on the chest X-ray. Correlation with previous films is often helpful to confirm that these changes are longstanding. HM

Conflict of interest: none.
The authors would like to thank the Royal United Hospital, Bath, and Dr Mike Bradley, Southmead Hospital, Bristol

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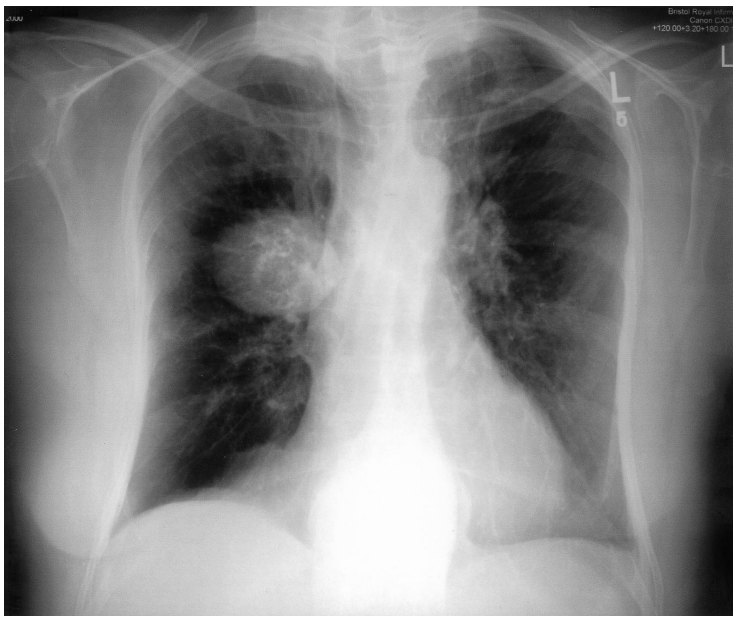

Figure 8. Hamartoma. Central popcorn calcification in a large soft tissue density mass adjacent to the right hilum.

KEY POINTS

- Calcification on the chest radiograph is a reflection of a previous disease process.
- It is not usually relevant to assessment of the acutely ill patient.
- It emphasizes the importance of taking a full medical history.