## CASE REPORT

# Coarse pleural calcification in a mesothelioma patient raises the possibility of a rare tumour subtype: osteoblastic sarcomatoid mesothelioma

<sup>1,2</sup>A M MORTIMER, <sup>1,2</sup>J ROWLANDS and <sup>2</sup>P MURPHY

<sup>1</sup>Severn School of Radiology and <sup>2</sup>Department of Radiology, Bristol Royal Infirmary, Bristol, UK

**ABSTRACT.** It is often suggested that calcification seen in association with pleural thickening implies benign disease. However, we present a case of a patient presenting with coarse pleural calcification associated with a pleural effusion and thickening, which following biopsy was shown to represent osteoblastic sarcomatoid mesothelioma. We describe the imaging features associated with this and differentiate these findings from those seen with benign pleural calcification. Similarities are drawn to other rare cases described in the literature.

The imaging features associated with mesothelioma and benign asbestos-related lung disease are well described [1–4]. Asbestos related pleural calcification has a characteristic appearance and distribution [2]. It is often suggested that calcification seen in association with diffuse pleural disease implies a benign process [5]. However, we present a case of a patient presenting with coarse circumferential pleural calcification associated with pleural thickening that following biopsy was found to be a rare mesothelioma subtype.

#### **Case report**

A 78-year-old male with a history of asbestos exposure presented 3 months following elective coronary artery bypass graft surgery, with worsening shortness of breath on exertion and normocytic-normochromic anaemia. An initial chest radiograph showed a small left pleural effusion (Figure 1). A subsequent chest ultrasound demonstrated flecks of pleural calcification within thickened pleura and follow-up chest radiograph performed several months later showed large clumps of left hemithoracic calcification associated with an enlarging pleural effusion (Figure 2). Consequential thoracic CT demonstrated circumferential pleural thickening containing multiple dense nodular clumps of calcification that were situated on all pleural surfaces, peripherally within, but orientated perpendicular to the pleural margin rather than having a flat, linear appearance consistent with a plaque (Figure 3).

The patient underwent a left rib resection and left lateral pleural biopsy. Operative findings included thick, malignant-looking pleura and multiple loculations. Received 4 March 2010 Revised 20 May 2010 Accepted 28 June 2010

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Immunohistochemical analysis showed expression of pancytokeratin, actin and desmin. There was diffuse, strong epithelial membrane antigen expression but no staining was seen for calretinin or cytokeratin 5/6. Although staining patterns of sarcomatoid mesothelioma are not consistent across all such tumours, these findings are inkeeping with the diagnosis [6]. Histological analysis of the pleural biopsies showed thickened and fibrotic pleura with diffuse, infiltrating sarcomatid tumour. The sarcomatous component showed neoplastic and pleomorphic spindle cells associated with high mitotic activity. Tumour osteoid was identified within this material (Figure 4), which accounted for the imaging features.

#### Discussion

Malignant mesothelioma is an uncommon but fatal neoplasm of the pleura and/or peritoneum. Incidence in the UK is increasing and the number of deaths as a result of this disease is expected to peak between the years of 2011 and 2015 at approximately 2000 per year [7]. Three principal histological subtypes have been identified: epitheloid, accounting for approximately 60%; sarcomatoid, approximately 10% of cases; and the biphasic subtype that exhibits a mixed histological pattern accounts for the remainder [8]. The epitheloid subtype has the best prognosis and sarcomatoid the worst [8]. All forms present similarly with chest pain, shortness of breath and weight loss [8]. Characteristic CT imaging findings include unilateral pleural effusion, nodular pleural thickening and interlobar fissure thickening. Growth typically leads to tumoural encasement of the lung with a rind-like appearance and contraction of the hemithorax [1, 4].

Nearly all cases of mesothelioma are related to previous asbestos exposure [8] which has several separate benign manifestations including calcification of pleural plaques

Address correspondence to: Alex Mortimer, Severn School of Radiology, Bristol Royal Infirmary, Bristol, UK. E-mail: alex\_mortimer@ hotmail.com



**Figure 1.** Initial posteroanterior chest radiograph demonstrating a small left pleural effusion without evidence of pleural calcification.

that are found on CT in approximately 20% of patients with malignant mesothelioma [4]. Pleural plaques are well-demarcated areas of pleural thickening, seen as elevated flat or nodular lesions that often contain calcification. Plaques are of variable thickness and range from <1 cm to approximately 5 cm in diameter [2]. These lesions usually represent parietal pleural deposits of hyalinised collagen fibres. They are a marker of asbestos exposure, becoming visible 20 or more years after the initial inhalation of asbestos fibres [9]. The classic distribution of pleural plaques seen on chest radiographs is the posterolateral chest wall between the seventh and tenth ribs, lateral chest wall between the sixth and ninth ribs, the dome of the diaphragm and the mediastinal pleura. CT findings support this distribution but also show anterior and paravertebral plaques that are not well demonstrated on chest radiographs [4].

It has been suggested that calcification seen in association with diffuse pleural disease implies benign disease [5]. In a CT series comprising 50 patients [10], 6 demonstrated calcification associated with mesothelioma, although in 5 of these patients this was thought to have arisen through involvement of benign plaque



**Figure 2.** Repeat posteroanterior chest radiograph with windowed region of interest demonstrating clumped calcification and pleural effusion in the left hemithorax.

with tumour. However, in one patient exhibiting sarcomatoid mesothelioma, stippled calcification was seen throughout the substance of a pleural mass. Although not further expanded upon by the authors, the sarcomatoid form of mesothelioma may show calcification through an independent neoplastic process rather than through involvement of pre-existing plaque. Occasionally, there is deposition of osteoblastic elements, sometimes in the form of bony trabeculae or ossified neoplastic cartilage [11, 12]. There is also potential for differentiation of pleural mesothelioma into osteogenic sarcoma [13]. This can be difficult to distinguish both radiologically and pathologically from mesothelioma with osteoblastic deposition but the history of asbestos exposure helps to distinguish the two conditions. Reports of imaging findings in cases of osteoblastic sarcomatoid mesothelioma are rare. Only two individual reports with histological verification [11, 12] were found in the radiological literature. In our case, and in contrast to the previously described appearance of benign calcific plaques, we noted unilateral, clumped, irregular, densely calcified pleural masses distributed fairly evenly throughout the substance of the thickened pleura. Our



**Figure 3.** (a) Axial and (b) coronally reconstructed contrast-enhanced CT demonstrating coarse, clumped calcification associated with pleural thickening in the left hemithorax.

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findings are similar to those obtained by Kawashima and Libshitz [10] in a case of sarcomatoid mesothelioma and in agreement with Raizon et al [11] and Chave et al [12] and who both described similar cases of histologically proven mesothelioma with osteoblastic deposition. Both groups reported coarse, focal calcified masses adjacent to or within the pleura.

### Conclusion

In the context of asbestos exposure, pleural calcification usually represents benign disease. However, although rare, atypical appearances including unusual distribution and morphology of calcification along with associated features such as pleural effusion or thickening should raise suspicion of this rare mesothelioma subtype.

#### References

- 1. Wang ZJ, Reddy GP, Gotway MB, Higgins CB, Jablons DM, Ramaswamy M, et al. Malignant Pleural Mesothelioma: Evaluation with CT, MR imaging, and PET. Radiographics 2004;24:105–19.
- 2. Hansell DM, Bankier AA, MacMahon H, McLoud TC, Müller NL, Remy J. Fleischner society: glossary of terms for thoracic imaging. Radiology 2008;246:697–722.
- 3. Peacock C, Copley SJ, Hansell DM. Asbestos-related benign pleural disease. Clin Radiol 2000;55:422–32.

Figure 4. Micrographs (a) low power, (b) high power of the pleural biopsy demonstrating a spindle cells infiltrating throughout the connective tissue (white arrow) with islands of tumour osteoid (black arrows).

- 4. Roach HD, Davies GJ, Attanoos R, Crane M, Adams H, Phillips S. Asbestos: when the dust settles an imaging review of asbestos-related disease. Radiographics 2002;22:S167–84.
- Leung AN, Muller NL, Miller RR. CT in differential diagnosis of diffuse pleural disease. Am J Roentgenol 1990;154:487–92.
- 6. Butnor KJ. My approach to the diagnosis of mesothelial lesions. J Clin Pathol 2006;59:564–74.
- 7. Hodgson JT, McElvenny DM, Darnton AJ, Price MJ, Peto J. The expected burden of mesothelioma mortality in Great Britain from 2002 to 2050. Br J Cancer 2005;92: 587–93.
- 8. Pass HI, Vogelzang N, Hahn S Carbone M. Malignant pleural mesothelioma. Curr Prob Cancer 2004;28:93–174.
- 9. Peacock C, Copley SJ, Hansell DM. Asbestos-related benign pleural disease. Clin Radiol 2000;55:422–32.
- Kawashima A, Libshitz HI. Malignant pleural mesothelioma: CT manifestations in 50 cases. Am J Roentgenol 1990;155:965.
- 11. Raizon A, Schwartz A, Hix W, Rockoff SD. Calcification as a sign of sarcomatous degeneration of malignant pleural mesotheliomas: a new CT finding. J Comput Assist Tomo 1996;20:42–4.
- 12. Chave G, Chalabreysse L, Picaud G, Blineau N, Loire R, Thivolet R, et al. Malignant pleural mesothelioma with osteoblastic heterologous elements CT and MR imaging findings Am J Roentgenol 2002;178:949–51.
- 13. Quoix E, Chenard MP, Orion B, Lang-Averous G, Dopff-Kaissling A. A left pleural effusion with a calcified tumoural mass and left hemithoracic uptake on bone scan Lung Cancer 2001;32:203–5.