Diagnostic evaluation of pleural masses with CT

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Authors: R. Quintana de la Cruz, E. Domínguez Ferreras, C. Pastor Sánchez, L. Caminero Pardo, J. Villanueva Liñán, A. Pérez Durán; Ciudad Real/ES
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Learning objectives

Describe characteristics of pleural masses with CT and establish an approach to differential diagnosis.
Background

Evaluation of pleural masses is advisable to obtain thin slices helical studies for evaluating pleura on several levels (especially simplifies the evaluation of lesions in the diaphragmatic pleura; Fig. 1 on page 6) with a delay of 30 to 40 seconds after CIV management, including an earlier stage without CIV if intralesional calcifications are suspected.

A) Benign pleural masses:

1. Lipomas: attenuation in range of fat (-50UH) Usually incidentally detected, Requiring no extension study (Fig. 2 on page 6 Fig. 3 on page 7). Occasionally shows areas of attenuation in range of soft tissue, which forces the differential diagnosis with liposarcomas.

2. Solitary fibrous Tumores: also known as benign mesotheliomas in classical literature. They are the most common benign pleural tumors, seating in most cases in visceral pleura. In general, they appear as well-defined solitary mass, sometimes lobed, smooth and rounded edges or oval, with soft tissue density, which sits in pleura without evidence of invasion of the chest wall. Following administration of VIC injury enhances the soft tissue rather than the thorax, although it is not uncommon cystic areas (no enhancement) inside the mass corresponding to necrosis, hemorrhage or cystic degeneration, most common in greater size lesions. Presence of calcifications is possible, although very rare and effusion can be seen occasionally associated with small amounts. Often is a pedunculated lesion and even visualising the pedicle in imaging studies may be complicated, however, show that a soft tissue lesion is pedunculated support is almost pathognomonic and highly suggestive of benign (Fig. 4 on page 8 Fig. 5 on page 9).

Localised malignant mesotheliomas: infrequent, can not be certainly distinguished from benign forms unless a pedicle can be demonstrated. They are typically larger masses (> 10cm) and are more likely shown central necrosis areas and several pleural effusion associated.


Malignant pleural masses include:

1. Secondary malignant pathology:
1.1 Metastasis: The most common cause of pleural multiple nodularities and frequently primary are, in order, lung (40%), breast (20%), intestinal origin tumor (including pancreas) and gynecological tumors (ovarian and uterus). The most common radiological manifestation is the malignant pleural effusion, but may present as masses / implants (Fig. 6 on page 10), often increased uptake in parietal pleura or fissures that may present behaviors parallel to the primary tumor (eg can appear calcified in bone forming tumors; Fig. 7 on page 11). CT can detect implants associated with effusion not visible in Rx, since it assesses both pleurae and is very useful for cases in which underlying malignancy focus is difficult to identify. Although unilateral and diffuse metastatic involvement is uncommon, when it appears radiological findings may be indistinguishable from mesothelioma.

1.2 Thymoma: although not in itself a pleural tumor, malignant thymoma shows some tendency to pleural invasion by contiguity, which can be identified as diffuse pleural thickening or diffuse uptake with or without multiple masses increased uptake growing nodular form on the affected area and often associated with effusion (Fig. 8 on page 12). If the involvement area is small, the distinction with a primary malignant pleural mass can be difficult.

2. Primary malignant patology:
2.1. Mesothelioma: also known as malignant mesothelioma in classical literature to differentiate pleural fibrous tumor, is a tumor arising from mesothelial cells, which can differentiate three subtypes: epithelioid (60%) (Fig. 9 on page 13), sarcomatoid (10%), and Mixed (30%) (Fig. 10 on page 14) of which is the most aggressive sarcomatoid, presenting trend early invasion of the chest wall and other adjacent structures. Morphologically in the initial stages is presented as a macroscopic and nodular pleural thickening, more pronounced in the lower chest, which is usually minimal and often goes unnoticed by itself, being more flashy associated hemorrhagic pleural effusion. As the disease progresses there is a pleural thickening longer generally lateral regions, with mediastinal pleural involvement or concentric involvement (Fig. 11 on page 15 and Fig. 12 on page 16) in advanced stages. TC is usually manifested as irregular and extensive nodular thickening, locally aggressive, affecting both pleurae, significantly enhances after contrast administration and calcifications in up to 20% of cases.

Presentation as a single well-defined mass is described but is uncommon, it being necessary in this case to make a differential diagnosis with pleural fibrous tumor, as previously discussed.

2.2 Lymphoma: primary pleural involvement by lymphoma is very rare, but HL or NHL pleural involvement, which determines a high stage of disease (I-IV), is not so unusual. Type of lymphoma that most often presents pleural masses is B-cell NHL with involvement of the visceral pleura, which manifests as thickening and / or pleural nodules, usually
associated with effusion and lymph node involvement (Fig. 13 on page 17, Fig. 14 on page 18, Fig. 15 on page 19).

2.3. Sarcoma: from embryonic mesodermal cells are very rare tumors and multiple chronic inflammation histologies possible can be associated with depending on particular cell who started the malignant transformation; described histiocytoma, synovial sarcomas, leiiosarcomas, etc. In general, by TC are discrete mass or diffuse thickening, potentially indistinguishable from mesothelioma, so the differential diagnosis requires biopsy and includes immunohistochemical and cytogenetic analysis.
Fig. 1: Mass pleural diaphragmatic (arrow) with questionable invasion of the diaphragm in patient with unknown primary. Exploration was used for planning core biopsy guided by ultrasound, reaching a diagnosis of primary small cell lung cancer without primary visible
Fig. 2: Chest PA RX with pleural soft tissue mass right, with pregnant sign itself extraparenchymal

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**Fig. 3:** Patient's chest CT Figure 1 with well-defined pleural mass very low density corresponding to a lipoma pleural.

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**Fig. 4:** Rx PA chest with right basal intraparenchymal lesion, suggestive of pleural mass

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Fig. 5: Thoracic CT patient in Figure 3 with pedunculated pleural and homogeneous mass, with benign fibrous tumor of the pleura characteristics, confirmed histologically.

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Fig. 6: White lung unilateral presence of multiple pleural masses, some of them large in a patient with renal carcinoma history, corresponding to neoplasm metastasis already known.

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Fig. 7: Lower view abdomen CT without IVC in patients with osteosarcoma history which appreciate calcified pleural metastatic lesions. Note irregular calcification pseudomass in right pleura and calcified nodules visible on the left pleura (arrow).

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Fig. 8: Mediastinal mass with pleural invasion (arrow) and irregular extension in adjacent parietal pleura with pleural effusion associated secondary, corresponding to a recurrent malignant thymoma

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Fig. 9: Mamelonated thickening, irregular and hyperenhanced right pleura in a patient with a history of asbestos exposure (note the calcified pleural plaque; arrow) compatible with mesothelioma and epithelioid mesothelioma histologically confirmed.

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Fig. 10: Effusion and poor outcome and hyperenhanced diffuse thickening of pleura with small nodular foci (arrow) in relation to mixed mesothelioma.

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Fig. 11: Pleural effusion and nodular pleural masses forming a "shell" around the lung by a malignant mesothelioma

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**Fig. 12:** Diffuse nodular left pleural thickening (same patient Figure 9) corresponding to malignant mesothelioma

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Fig. 13: Pleural and chest wall by lymphomatous mass in patient with large B-cell lymphoma histologically confirmed. Note the parietal mass and small foci of enhanced in diaphragmatic pleura

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Fig. 14: Pleural effusion and small subdiaphragmatic lymphadenopathy hyperenhanced in patient Figure 11, which together with abdominal lymphadenopathy visible in Figure 13, excluding diagnosis of primary effusion lymphoma.
**Fig. 15:** Left retrocrurals lymphomatous lymphadenopathy in patient of Figure 11

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Imaging findings OR Procedure details

Malignant pleural masses on CT will suggest malignancy:

1. Pleural thickness greater than 1 cm.
2. Pleural nodules spread.
3. Concentric pleural thickness, enclosing lung.
4. Mediastinal pleura involvement

It is important that although the presence of these signs is suggestive of malignancy, their absence does not exclude, therefore, quite often the main utility of CT is the location of the lesion and percutaneous biopsy guide.
Conclusion

CT is the modality of choice for initial characterization of pleural masses as it allows evaluating multiple pleural masses, establish location, extent and nature in many cases: benign / malignant, and even, in some cases, a specific diagnosis.

On the other hand, the location of the lesion on CT may, if necessary, guide interventional procedures and treatments (Fig. 16 on page 23 Fig. 1 on page 23)
Fig. 1: Mass pleural diaphragmatic (arrow) with questionable invasion of the diaphragm in patient with unknown primary. Exploration was used for planning core biopsy guided by ultrasound, reaching a diagnosis of primary small cell lung cancer without primary visible.
**Fig. 16**: Image of core biopsy (note hyperechogenic line in the center of the image traverses pleural mass, corresponding to the biopsy needle) in the patient of Figure 1

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Personal Information


Department of Radiology. Hospital General de Ciudad Real. Spain.