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Abstract
This study describes the diffuse neoplastic conditions that may affect pleural membranes. These include mesothelioma, the most important and common malignancy of pleural origin, and metastatic involvement by carcinomas, lymphomas and thymomas. On the basis of diagnostic imaging, we identify the distinctive features of pleural involvement by each of these conditions and provide elements enabling accurate differential diagnosis. Finally, we discuss the best diagnostic approach in the case of suspected primary or secondary neoplastic involvement of pleural membranes.

Keywords Malignant pleural mesothelioma · CT · Pleural metastases · MR imaging · Pleural neoplasms

Introduction
Pleural neoplasms may be classified as benign or malignant and primary or secondary. They manifest as diffuse pleural thickening at times associated with fluid effusion or, less commonly, as focal lesions [1]. Malignant pleural mesothelioma is the most frequent primary pleural neoplasm. Its onset is closely linked to a history of occupational or environmental exposure to asbestos, and it is characterised by extremely aggressive behaviour and a dismal prognosis. Although any malignancy is capable of giving rise to pleural metastases, cancers of the lung and breast, lymphomas,
and gastrointestinal and genitourinary cancers are those that most frequently metastasise to the pleura [2].

The diagnostic contribution of imaging, in particular of radiology [conventional radiography and computed tomography (CT)], is universally acknowledged and well documented. Magnetic resonance (MR) imaging and, more recently, positron emission tomography (PET) have increasingly gained ground as level-two techniques capable of contributing additional useful information to the diagnosis and staging of disease. Chest ultrasound (US) may also play an important role in the diagnosis of diffuse neoplastic conditions of the pleura as it relies on the same semiological criteria as CT or magnetic resonance (MR) imaging: its use in chest imaging has recently gained increasing acceptance, overcoming the extreme suspicion with which it was viewed in the past. A finding often associated with, and in some cases predominates, the clinical picture in both inflammatory and neoplastic lesions is pleural effusion: in the differential diagnosis, identifying serosal thickening, especially if nodular, may prove highly useful.

In consideration of the frequency with which radiologists are called upon to differentiate among diffuse neoplastic conditions of the pleural serosa and the clinical importance of a prompt diagnosis, this paper illustrates imaging features typical of primary and secondary diffuse pleural neoplasms and briefly discusses the use of thoracoscopy and cytologic examination.

**Primary neoplastic disease: malignant pleural mesothelioma**

Malignant pleural mesothelioma is the most frequent primary neoplasm of the pleura. Its incidence has been increasing as a result of the growing occupational and environmental exposure to asbestos fibres. As the latency period between asbestos exposure and disease onset is at least 20 years, the highest incidence is seen in individuals in the sixth through eighth decade of life, and as most cases develop as a result of occupational exposure, men are more frequently affected than women, the rates being 15 and three cases per million, respectively [3, 4].

At onset, the radiological pattern is characterised by pleural effusion, which may be moderate (Fig. 1a) or, more often, profuse, with involvement of an entire hemithorax and contralateral mediastinal shift. In other cases, the effusion may be accompanied by slight mediastinal retraction due to “freezing” of the pleural–mediastinal structures by changes in the underlying pleura (Fig. 1b). Plaques or calcifications testifying to asbestos exposure may be present in 20% of cases (Fig. 1c) [5]. The main diagnostic feature is diffuse pleural thickening: the surface appears smooth and its thickness is not uniform, with frequent nodularity (Fig.