



Editorial

Usefulness of Magnetic Resonance in Suspected Lung Cancer in Silicosis Patients[☆]



Utilidad de la resonancia magnética en la sospecha de cáncer de pulmón en pacientes con silicosis

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Silicosis is a diffuse interstitial lung disease characterized by the production of collagen tissue in the lung in response to silica dust deposits after inhalation of crystalline silica (SiO₂).¹ Its most common clinical form is chronic silicosis, which in turn has two variants: simple and complicated chronic silicosis. Simple silicosis may evolve to the complicated form of the disease as a consequence of a complex interaction between the intensity of exposure to SiO₂ inhalation and the genetic susceptibility of the individual.

The typical histological lesions in simple silicosis are nodules with hyaline fibrosis in concentric layers and macrophages loaded with dust. In complicated silicosis, the nodules tend to merge, forming progressive massive fibrosis (PMF) lesions consisting of a fibrous stroma with an amorphous acellular content, rich in mucopolysaccharides and inorganic material.

Radiologically, simple silicosis manifests as a diffuse, bilateral micronodular pattern, with opacities measuring less than or equal to 10 mm in diameter. In general, there is greater involvement in the upper lobes and posterior segments of the lung. Complicated silicosis arises from the confluence of these nodules, forming PMF lesions with a diameter of more than 10 mm.² The characteristics of PMF on standard X-ray and computed tomography (CT) of the chest have been widely documented for several decades³: these are nodules or irregular masses containing calcifications, usually located in the upper or middle areas of the lungs, surrounded by parenchyma of emphysematous appearance. When PMF does not present these typical characteristics, it can be challenging to distinguish it from lung cancer, and invasive techniques often have to be performed to obtain biopsies.

The role of positron emission tomography in the assessment of PMF is not established. Intense uptake has been described in

PMF, similar to that seen in neoplasms, so the indiscriminate use of this technique could lead to invasive techniques being performed that might not be strictly necessary.⁴ However, magnetic resonance imaging (MRI) does seem to provide useful data for distinguishing between PMF and cancer. MRI is based on identifying the content and distribution of the hydrogen protons in water molecules. Because PMF is basically made up of fibrous tissue, it should produce a different signal from cancerous tumors. Surprisingly, there are hardly any studies that evaluate the usefulness of MRI in distinguishing between PMF and lung cancer.

The first article addressing this issue dates back to 1998.⁵ It describes the case of a 66-year-old man with previously diagnosed silicosis, undergoing examinations following the discovery of a lesion in the right upper lobe, absent in an X-ray obtained one year previously. A chest CT scan showed a homogeneous mass with irregular margins containing small calcifications. Given these inconclusive findings, the authors decided to perform an MRI, which revealed a mass with 2 differentiated components. The upper area showed high signal intensity (SI) in the T1W and T2W sequences, while low SI was seen in the lower area in both sequences. A biopsy performed by bronchoscopy led to the diagnosis of squamous cell carcinoma. Analysis of the lobectomy specimen revealed the presence of a PMF mass containing a carcinoma. The authors concluded that fibrous PMF tissue in T1W and T2W sequences has a low SI, similar to that of muscle, while lung cancer has a high SI, especially in the T2W sequence. Other articles^{6,7} have concurred that the typical findings of PMF in MRI include a low SI in the T2W sequence, and a gradual increase of SI in the dynamic studies.

Few studies have examined in further depth the usefulness of MRI for distinguishing between lung cancer and PMF. In 2017, Ogi-hara et al.⁸ published a retrospective study of 28 patients with known pneumoconiosis, in whom 40 lesions with a suspicion of malignancy were found on CT. MRI images were obtained from all lesions, and SI in the T1W and T2W sequences was evaluated. The lesions were classified as neoplasms when they showed an intermediate or high SI in T2W, or a heterogeneous or ring-like

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enhancement pattern in the case of contrast-enhanced studies. The definitive diagnosis was provided by lesion biopsy or by clinical follow-up. These results correlated with the assessment of lesions by MRI, with a sensitivity of 100% and a specificity of 94% for the diagnosis of PMF when SI in the T2W sequence was evaluated. Analysis of the enhancement pattern after contrast administration had a sensitivity of 35% and a specificity of 44%. The authors conclude that, in cases in which the distinction between PMF and cancer is difficult on CT, an additional study with MRI, especially the T2W sequence, can help distinguish between both entities. Similar results were obtained by Zhang et al.⁹ in 25 patients diagnosed with coal worker's pneumoconiosis.

We should remember that all these studies have significant weaknesses: they are retrospective, with a small number of patients, and MRI was evaluated using different machines and different protocols. In the absence of new studies, MRI (especially the T2W sequence) appears to have value in distinguishing between lung cancer and PMF, in cases in which CT does not provide conclusive information, helping avoid invasive tests being performed for the exclusion of cancer.

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References

1. Adverse effects of crystalline silica exposure. American Thoracic Society Committee of the Scientific Assembly on Environmental and Occupational Health. *Am J Respir Crit Care Med.* 1997;155:761–8.
2. González Vázquez M, Trinidad López C, Castellón Plaza D, Calatayud Moscoso del Prado J, Tardáguila Montero F. Silicosis pulmonar: hallazgos radiológicos en la tomografía computarizada. *Radiología.* 2013;55:523–32.
3. Bergin C, Muller N, Vedal S, Chan-Yeung M. CT in silicosis: correlation with plain films and pulmonary function tests. *AJR Am J Roentgenol.* 1986;146:477–83.
4. Chung SY, Lee JH, Kim TH, Kim SJ, Kim HJ, Ryu YH. ¹⁸F-FDGPET imaging of progressive massive fibrosis. *Ann Nucl Med.* 2010;24:21–7.
5. Matsumoto S, Miyake H, Oga M, Takaki H, Mori H. Diagnosis of lung cancer in a patient with pneumoconiosis and progressive massive fibrosis using MRI. *Eur Radiol.* 1998;8:615–7.
6. Matsumoto S, Mori H, Miyake H, Yamada Y, Ueda S, Oga M, et al. MRI signal characteristics of progressive massive fibrosis in silicosis. *Clin Radiol.* 1998;53:510–4.
7. Jung JI, Park SH, Lee JM, Hahn ST, Kim KA. MR characteristics of progressive massive fibrosis. *J Thorac Imaging.* 2000;15:144–50.
8. Ogiwara Y, Ashizawa K, Hayashi H, Nagayasu T, Hayashi T, Honda S, et al. Progressive massive fibrosis in patients with pneumoconiosis: utility of MRI in differentiating from lung cancer. *Acta Radiol.* 2018;59:72–80.
9. Zhang L, Wang C, Yan Q, Zhang T, Han Z, Jiang G. Diagnostic and clinical application value of magnetic resonance imaging (MRI) for progressive massive fibrosis of coal worker pneumoconiosis: case reports. *Medicine.* 2017;96:e6890.