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A Case of Lung Cancer Developing in the Background of Progressive Massive Fibrosis

Progresif Masif Fibrozis Zemininde Gelişen Akciğer Kanseri Olgusu

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Abstract

Pneumoconioses are parenchymal lung diseases caused by dust accumulation in the lungs and the resulting tissue reaction. A 60-year-old male patient was admitted to our clinic with complaints for 3 months of weakness, fatigue and constant pain in the right arm that did not change with movement. His professional history revealed employment in glazing processes in the ceramics industry for 28 years, while his medical history included pneumoconiosis and coronary artery bypass surgery in 2015. A recent postero-anterior chest X-ray had revealed increased opacity in the apical region of the right lung compared to a radiograph taken 3 years earlier. A high-resolution thorax computed tomography of the lungs was performed revealing a 5 cm diameter mass lesion in the upper lobe of the right lung, although no differentiation between the mass and progressive massive fibrosis (PMF) could be made. Thoracic magnetic resonance imaging was performed after mass development was suspected on the basis of PMF, and a malignant lesion that was hyperintense compared to muscle and PMF tissue was observed in the apical segment of the right lung upper lobe on T2W images. No endobronchial lesion was observed in the patient on bronchoscopy, while a transthoracic biopsy performed on the hyperintense area was reported as adenocarcinoma. We present a case of PMF pneumoconiosis presenting with lung cancer.

Keywords: *Silicosis, fibrosis, cancer.*

Öz

Pnömokonyozlar, akciğerlerde toz birikimi ve bunun sonucu oluşan doku reaksiyonu ile meydana gelen parankimal akciğer hastalıklarıdır. Altmış yaşında erkek hasta kliniğimize 3 aydır devam eden halsizlik, çabuk yorulma, sağ kolda hareketle değişmeyen ve sürekli olan ağrı şikayeti ile başvurdu. Meslek öyküsünde 28 yıldır seramik sektöründe sırlama işi yaptığı öğrenildi. Özgeçmişinde 2015 yılında pnömokonyoz tanısı ve koroner arter bypass ameliyatı öyküsü mevcuttu. Yeni çekilen postero-anterior akciğer grafisinde 3 yıl önce çekilen radyografiye göre sağ akciğer apikal bölgede opasite artışı saptandı. Yüksek rezolüsyonlu toraks bilgisayarlı tomografi çekildi, sağ akciğer üst lobda 5 cm çapında kitle lezyon saptandı, ancak kitle ve Progesif Masif Fibrozis (PMF) ayrımı yapılamadı. Akciğerde PMF zemininde kitle gelişiminden şüphelenilen hastaya torakal manyetik rezonans görüntüleme yapıldı. MR'da sağ akciğer üst zonda PMF zemininde malignite geliştiği düşünülen görünüm saptandı. Bronkoskopi yapılan hastada endobronşiyal lezyon izlenmedi. Kanser düşünülen alandan alınan transtorasik akciğer biyopsisi sonucu adenokarsinom olarak raporlandı. Akciğer kanseri ile prezente olan progresif masif fibrozisli pnömokonyoz olgusunu sunduk.

Anahtar Kelimeler: *Silikozis, fibrozis, kanser.*

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Pneumoconiosis refers to the accumulation of inorganic dust, fumes and fibers, originating mostly from industrial environments and causing a fibrotic tissue reaction in the lung (1). Silicosis, coal worker's pneumoconiosis (CIP), asbestosis, berylliosis, hard metal lung disease, mixed dust pneumoconiosis and talcosis are the most well-known forms of pneumoconiosis (2). They are examined in two main groups according to their radiological appearance as simple and complicated, with simple pneumoconiosis referring to the presence of round or linear opacities less than 1 cm in the chest radiograph, and progressive massive fibrosis (PMF), known also as complicated pneumoconiosis, referring to the appearance of opacities larger than 1 cm with small opacities on chest X-ray (3,4). Unilateral PMFs in particular can mimic lung cancer, and while the incidence of lung cancer in patients with pneumoconiosis is high (17.9%) (5,6), it is difficult to differentiate lung cancer from pneumoconiosis with X-ray and computed tomography (CT) imaging methods (7). With technological developments, functional information on lung masses can now be obtained with magnetic resonance imaging (MRI), leading to the description of MRI findings of PMF in recent years (8,9). Here, we present a case of pneumoconiosis in whom lung cancer was detected in the PMF lesion on thoracic MRI.

CASE

A 60-year-old male patient was admitted to our clinic with complaints of weakness, fatigue and constant pain for 3 months in the right arm that did not change with movement. The patient had a 30-pack/year smoking history but had not smoked for 8 years. On physical examination, his general condition was good and his vital signs were stable, while a chest examination revealed decreased respiratory sounds in the upper zone of the right lung. Laboratory values at admission were within normal limits. The patient had been diagnosed with pneumoconiosis in 2015 but had not attended subsequent follow-ups. His continuing employment as a glazer in the ceramic industry for 28 years involved spraying silica-containing paint onto sinks with an air-jet gun in a semi-enclosed cabin. He had undergone coronary artery bypass surgery in 2015. A PA chest X-ray revealed an increase in opacity in the apical region of the right lung compared to a radiograph taken 3 years earlier, and the patient was duly hospitalized for further examination (Figures 1a and b). Simultaneous lung HRCT revealed a solid 5-cm diameter lesion in the upper lobe of the right lung (Figure 2). In PET-CT taken in terms of malignant etiology, a pathologically increased FDG uptake was observed in the mass lesion in the right lung upper lobe and in the surrounding millimetric nodular densities, mediastinal and hilar lymph nodes, as well as a soft tissue density causing destruction in the T2-3 vertebrae, however, the mass and PMF could not be differentiated (Figure 3). MRI was performed in the belief that it could differentiate lung cancer and PMF based on their signal intensities, with Pre-contrast T1 and T2W diffusion imaging and dynamic postcontrast T1W imaging. The T2W images revealed the mass to be more hyperintense than the muscle, causing distortion in the environment, as well as contrasting that became evident towards the progressive phases in the dynamic contrast acquisition (Figure 4). No endobronchial lesion was observed in the patient on bronchoscopy, while the results of a transthoracic biopsy performed on the hyperintense area indicated adenocarcinoma. (Figure 5a, b and c). The patient was duly referred to the Oncology Department with a diagnosis of lung cancer.

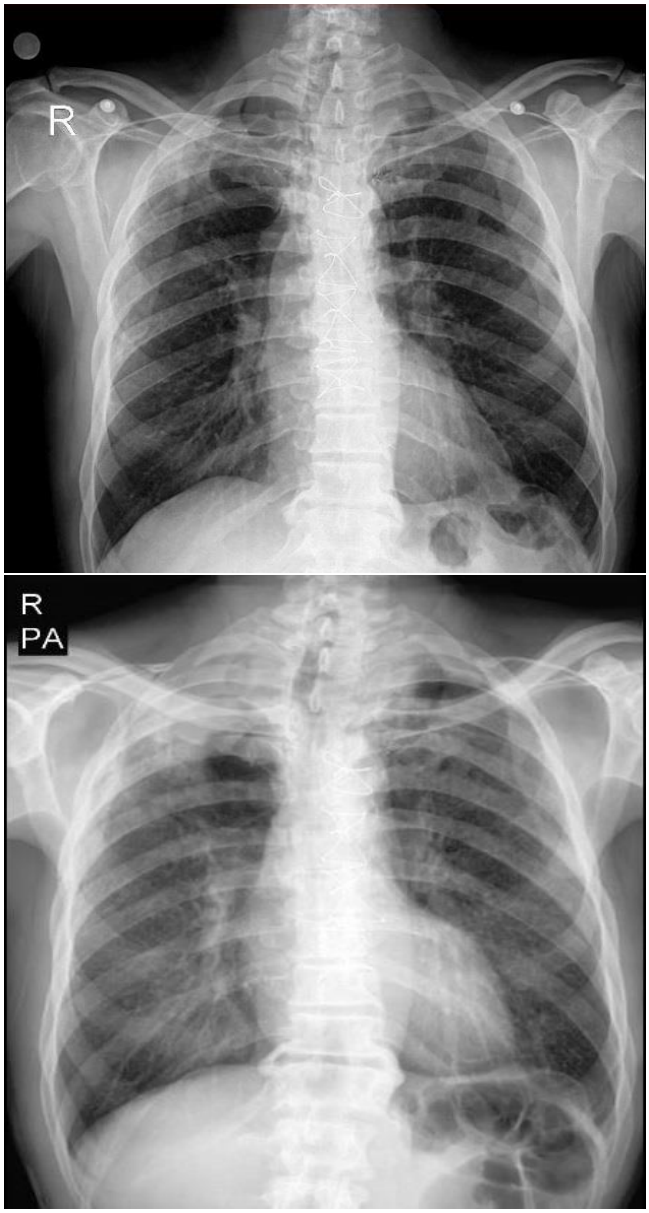

Figure 1a and b: Opacity increase in the right upper zone in the newly taken chest radiograph compared to a radiograph from 3 years earlier

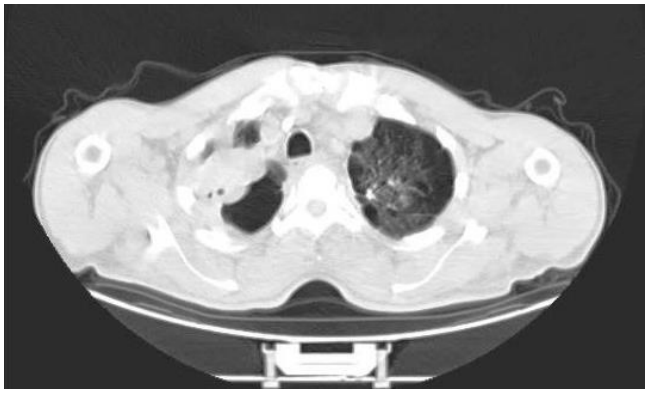

Figure 2: Thoracic computed tomography revealing a 5-cm mass in the upper lobe of the right lung

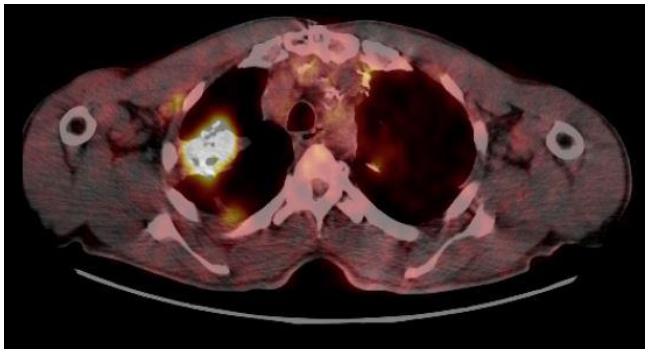

Figure 3: PET-CT showing increased FDG uptake in a mass lesion

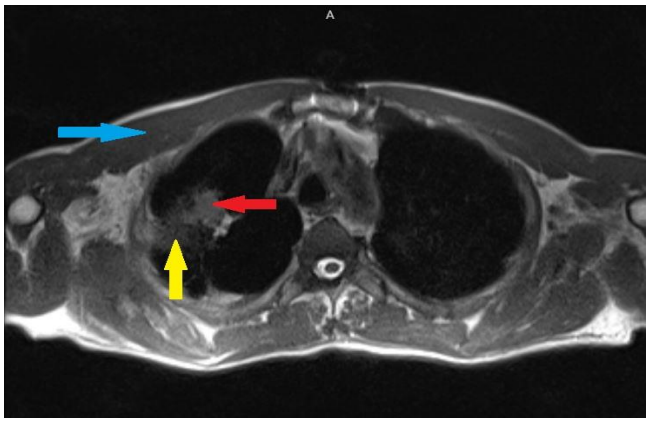

Figure 4: Thoracic MRI T2W image of a hyperintense area of a malignant lesion in the PMF lesion that is hypointense in the apical segment of the upper lobe of the right lung (Blue arrow: Muscle, Yellow arrow: PMF, Red arrow: Malignant lesion)

DISCUSSION

Pneumoconiosis is a preventable disease that is frequently reported in Türkiye. Silica is one of the main components of rock and sand, and many different business lines, such as mining, quarrying, brick and ceramic production, and foundry operations carry the risk of silicosis (10). The cytotoxic effect of silica on alveolar macrophages would appear to be related to the pathogenesis of silicosis. Silica particles that cannot be completely cleared from the lung can damage the alveolar macrophages responsible for their removal from the lung, and these damaged macrophages are thought to release reactive oxygen and nitrogen species as well as free radicals. When the damaged alveolar macrophages containing silica ultimately die, they release the ingested silica particles and the silica particles are re-ingested by another macrophage, thus entering into a cycle of damage (11,12). PMF is an advanced form of chronic pneumoconiosis that is pathologically defined by the clustering of silicotic nodules fused with connective tissue in silicosis and in coal macules surrounded by fibrous tissue in coal worker's pneumoconiosis (13). The International Agency for Research on Cancer is an independent scientific organization within the World Health Organization that is responsible for classifying the carcinogens that cause human cancer development, of which there are four groups. Agents that are determined to cause cancer in humans are classified as Group 1, among which inhaled crystalline silica can be counted (14). Studies have identified a high incidence of lung cancer in the background of PMF6,8. Matsumoto et al. reported on a case of squamous cell lung cancer developing within a PMF lesion in 1996 in which the cancer tissue appeared hyperintense compared to the PMF lesion on MRI T2W images (15). In a study by Katabami et al. (16), an association with lung cancer was more likely in patients with diffuse interstitial fibrosis (DIF) pneumoconiosis than in those with pneumoconiosis without DIF. It has been found that lung cancers develop more in DIF areas, and squamous cell carcinoma in particular. In our case, lung adenocarcinoma was detected within the PMF lesion on MRI. It has been used in the diagnosis of diseases by determining the content and distribution of hydrogen protons in the water molecules of the tissues in MRI. Studies suggesting the use of MRI for the differentiation of PMF and malignant lesions have reported PMF lesions to be hypointense when compared to skeletal muscle on T2W images, while malignant lesions are hyperintense compared to skeletal muscle (17,18). In our case, malignant tissue showed high signal intensity while fibrotic masses showed low signal intensity, and the difference in signal intensity was more apparent on T2W images.

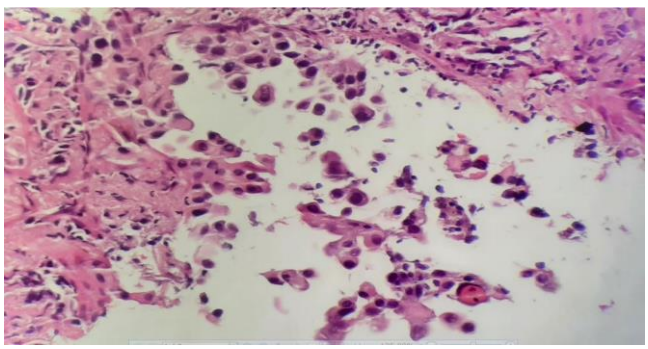

Figure 5a: A tumoral structure infiltrating the lung parenchyma as acinar, papillary and micropapillary structures is observed (HEx400)

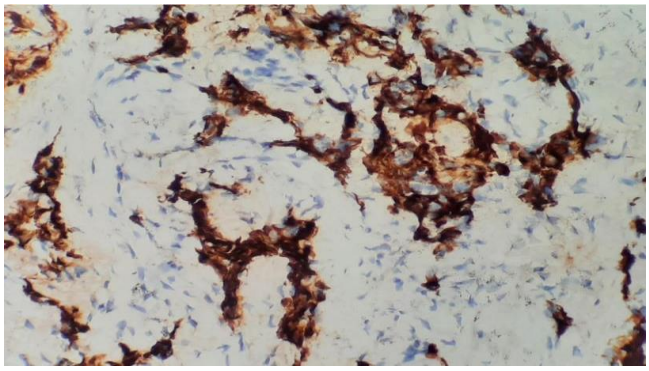

Figure 5b: Pankeratin positivity in tumor cells (pankeratinx400)

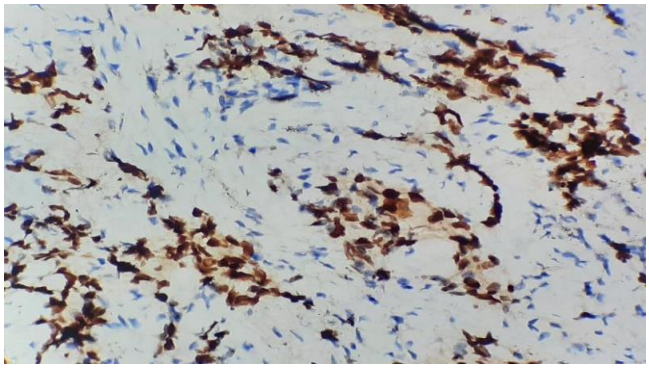

Figure 5c: TTF1 positivity in tumor cells (TTF1x400)

CONCLUSION

PMF lesions can sometimes confused with malignant lesions. We recommend thoracic MRI for patients with PMF who are thought to have accompanying lung cancer, as hyperintense areas in PMF lesions on MRI T2W images can help identify the target areas of a needle biopsy.

CONFLICTS OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Concept - S.Ö., G.S., A.K., C.Ş., F.D., S.U.R., N.Z.; Planning and Design - S.Ö., G.S., A.K., C.Ş., F.D., S.U.R., N.Z.; Supervision - S.Ö., G.S., A.K., C.Ş., F.D., S.U.R., N.Z.; Funding - S.Ö., G.S.; Materials - S.Ö.; Data Collection and/or Processing - S.Ö., F.D., S.U.R.; Analysis and/or Interpretation - S.Ö., N.Z.; Literature Review - S.Ö.; Writing - S.Ö.; Critical Review - S.Ö., G.S.

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