Intrapulmonary solitary fibrous tumor is extremely rare. A few reports have presented typical CT findings such as well-defined, variable-sized, heterogeneously or homogeneously well-enhanced intrapulmonary nodules. We report herein a rare case of intrapulmonary solitary fibrous tumor that showed typical clinical and CT features, and we also provide an ancillary CT finding that shows a distinguishable tubular vascular structure within the nodule. The tubular vascular structure was conjoined to the proximal pulmonary vein. In this study, we highlight an ancillary CT finding reported for the first time for the diagnosis of a patient with intrapulmonary solitary fibrous tumor.

Index terms
Solitary Fibrous Tumor
CT
Lung Neoplasm

INTRODUCTION

Solitary fibrous tumors are benign or malignant neoplasms originating from mesothelial and submesothelial cells that most frequently occur in the pleura, but they may also occur at various extrapleural sites (1, 2). Intrapulmonary solitary fibrous tumors are extremely rare and may present as well-defined, round or ovoid nodules on computed tomography (CT) scan, leading to widely differing imaging diagnoses including hamartomas and carcinoid tumors (2, 3). We report herein a rare case of intrapulmonary solitary fibrous tumor that showed typical features on enhanced chest CT scan, and we also provide a helpful ancillary CT finding for the diagnosis of intrapulmonary solitary fibrous tumor.

CASE REPORT

A 64-year-old woman was admitted to our hospital for investigation of an abnormal chest radiographic finding. She had no symptoms, no smoking history, and no specific history except old pulmonary tuberculosis. Chest radiography revealed a roughly 3 cm ovoid nodule in the right lower lobe. Enhanced chest CT scan showed a well-circumscribed intrapulmonary nodule with heterogeneous enhancement. Additionally, a distinguishable tubular vascular structure was seen within the nodule (Fig. 1). The tubular vascular structure was conjoined to the proximal pulmonary vein. The feeding artery was not visualized. There was no mediastinal or hilar lymphadenopathy. At that time, our impression was carcinoid tumor or sclerosing hemangioma.

For the mass, transthoracic percutaneous needle biopsy was performed. The pathology report was not diagnostic of disease without evidence of malignancy. A follow-up CT scan was performed within 6 months. The mass had increased in size from 3.0 cm to 3.4 cm with an increase in the internal low attenuated portion. The patient underwent right lower lobectomy using video-assisted thoracic surgery. Grossly, the resected specimen was a
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well-circumscribed, ovoid solid mass that did not involve the pleural surface. Microscopically, the tumor consisted of packed spindle cells with uniform cellularity. Thin-walled vessels with staghorn configuration were seen (Fig. 2A). Tumor cells were round to fusiform, and they showed indistinct cellular margins and bland vesicular nuclei (Fig. 2B). Cellular atypia or mitotic figures were not seen. Immunohistochemical staining for CD34 was diffusely positive in the tumor. The mass was diagnosed as intrapulmonary benign solitary fibrous tumor.

DISCUSSION

Solitary fibrous tumors were originally described as arising from the pleura, but the tumors have been discovered in other thoracic areas (mediastinum, pericardium, and lung) as well as in extrathoracic areas (head, neck, breast, abdomen, pelvis and extremities) (1, 2, 4, 5). Solitary fibrous tumors of the lung (intrapulmonary solitary fibrous tumors) that are completely separated from the pleura are extremely rare. Two main hypotheses for the intraparenchymal location of these tumors have been sug-

![Fig. 1. A 64-year-old woman with intrapulmonary solitary fibrous tumor. Sequential enhanced chest CT scans (A–D) demonstrate a well-defined, ovoid nodule in the right lower lobe with heterogeneous enhancement and it has a distinguishable tubular vascular structure (arrows). The tubular vascular structure is conjoined to the right proximal pulmonary vein. CT = computed tomography](image-url)
gested: the tumor may arise from the interlobular septal connective tissue or it develops from pulmonary parenchymal fibroblasts (2, 3, 5).

A few solitary fibrous tumors of the pleura with inverted growth were previously reported as intrapulmonary fibrous tumors (6, 7). Although some intrapulmonary solitary fibrous tumors attached or close to the pleura were reported (5, 8, 9), intrapulmonary solitary fibrous tumors located in the deep pulmonary parenchyma have rarely been described in the radiologic literature (3, 4, 10).

Most intrapulmonary solitary fibrous tumors were reported in the pathology, radiology and thoracic surgery literature. In 2013, Rao et al. (5) presented a clinical and pathologic study of 24 cases of tumors that showed variable sizes, variable lobe origins and were found in the middle-age population. However, CT scan images were available in only 2 out of the 24 cases.

In 2011, Kawaguchi et al. (8) reported a case of intrapulmonary solitary fibrous tumor and reviewed the literature; the authors reviewed 11 reports. They also found several epidemiologic and clinical features that were similar to those in the previously mentioned study (5). However, either CT images were not included or limited CT images from unenhanced CT scans or chest CT scans of the lung window were illustrated in several previous studies including the 11 reviewed reports (2, 4, 5). Also, there were few radiologic features available that were specific to intrapulmonary solitary fibrous tumor. In general, intrapulmonary solitary fibrous tumor typically manifests as a well-defined, variable-sized, and homogeneously or heterogeneously enhanced tumor on enhanced chest CT scan, similar to the features of the solitary fibrous tumor of the pleura (2). Although to the best of our knowledge, there is no well-documented series in the radiologic literature regarding the CT features of intrapulmonary solitary fibrous tumor, there were a few cases that showed typical features on enhanced CT scan (3, 8). Specifically, Patsios et al. (3) described the pattern of contrast enhancement of the tumor on CT scan that showed avid peripheral enhancement at 1 minute and persistent heterogeneous enhancement at 2 and 4 minutes.

Our case also showed clinical and CT features that were similar to those in the previous studies (3, 5, 8). Interestingly, we found an ancillary CT finding that has not been reported before. This finding was a distinguishable dilated tubular vascular structure in the tumor. The vascular structure was conjoined to the proximal pulmonary vein. Wignall et al. (9) reported that collateral feeding vessels were seen in 12 of the 34 cases of extrathoracic solitary fibrous tumor (35%). They also suggested that although it is not specific, this finding is a useful distinguishing imaging feature of solitary fibrous tumor. Prominent intraluminal vessels were often seen within the solitary fibrous tumor of the pleura (6). However, in our case, connection of the feeding vessel to the pulmonary vein in the tumor was seen and it seemed to be related to the intrapulmonary location. To the best of our knowledge, this case is the first report of an intrapulmonary vessel conjoined to solitary fibrous tumor. We think that the di-

Fig. 2. Pathological findings of the tumor.
A. A uniformly hypercellular tumor shows dilated and divided vessels, a staghorn configuration (hematoxylin and eosin stain, × 40).
B. Spindle cells show a patternless pattern, an indistinct cellular margin, round to oval nuclei and short dense collagen fibers (hematoxylin and eosin stain, × 200).
lated vascular structure may reflect some characteristic histopathologic findings of solitary fibrous tumor. Microscopically, these tumors consist of whorls of reticulin and collagen with interspersed spindle-shaped cells and they may be classified as patternless (with intermingling collagen and tumor cells in a random distribution), hemangiopericytoma-like (with prominent networks of anastomosing vessels), fibrosarcoma-like, or diffuse sclerosing in nature (2, 10). Our case also demonstrated the patternless and hemangiopericytoma-like patterns. Among these patterns, the hemangiopericytoma-like pattern was characterized by increased vascularity with branching, thick-walled vessels with a staghorn appearance (1); we believe that these patterns may reflect the ancillary CT features.

In conclusion, when there is a well-defined, homogeneously or heterogeneously enhanced intrapulmonary nodule in asymptomatic middle-aged patients that also comprises an additional conjoined tubular vascular structure within the tumor, these CT features may assist in diagnosing intrapulmonary solitary fibrous tumor.

REFERENCES

폐내 고립성 섬유종의 추가적인 전산화단층촬영 소견: 증례 보고

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폐내 고립성 섬유종은 매우 드물다. 몇몇의 보고들에서 명확한 모양, 다양한 크기, 그리고 불규칙 혹은 균일하게 조영 증강이 잘되는 폐내 결절로 나타나는 전형적인 전산화단층촬영 소견을 제시한 바 있다. 본 증례는 그런 전형적인 소견과 더불어, 결절내부로 연결되는 틀처럼 혈관이 추가적으로 전산화단층촬영에서 관찰되었다. 그 혈관 구조는 근위부 폐정맥과 연결되었다. 이에 저자들은 폐내 고립성 섬유종을 진단하는 데 이러한 추가적인 전산화단층촬영 소견을 처음으로 보고한다.

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