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CASE REPORT

Challenging Diagnosis: Unmasking the Enigma of Imaging Findings with Lung Schwannomas

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Abstract: Schwannomas are benign slow-growing tumors arising from the embryonic neural crest cells of the nerve sheaths of peripheral and cranial nerves, and they are a rare type of soft tissue mass that is usually always solitary. Generally, it grows in the head, neck, and flexor portions of the limbs, where many nerves are located. Schwannomas of the lung are extremely rare. Fewer than ten cases of schwannomas in this organ region have been reported in the existing literature. In this case report, a 40-year-old male non-smoker was hospitalized with occasional chest pain. His chest computed tomographic scan revealed a 3.8 cm space occupying lesion in the upper lobe of the right lung. This lesion has clear boundaries and uneven internal density. And it was concluded as a benign lesion possibility, it is preferred to be considered as a haematoma. This space occupying lesion was eventually confirmed as a schwannoma by needle biopsy tissues. Due to the presence in rare locations, such as the lung, the clinical presentation of this space occupying lesion is non-specific, making diagnosis difficult. The data presented in this case report can help clinicians to obtain information on the identification of this disease, which highlighted lung schwannoma as a differential diagnosis for patients with intermittent pain. It can also alert clinicians and radiologists to observe every detail of the radiology imaging findings.

Keywords: diagnosis, schwannoma, lung cancer, thoracic radiology, solitary pulmonary nodule

Introduction

Lung space occupying lesions are common clinical diseases, and the common pathological results of these lesions are lung cancer, lung hamartoma, tuberculosis, COVID-19, and so on.[1–4] There are very few reports of lung space occupying lesions that are lung schwannomas, after all, there is not much nerve distribution in the lung.[5] In this case report, we present the case data and diagnostic process of a patient who was misdiagnosed as lung haematoma due to space-occupying lesions in the upper lobe of the right lung. The final pathological diagnosis revealed that it was a lung schwannoma. We analyzed the cause of misdiagnosis of this case, in order to provide a more comprehensive perspective for the diagnosis of lung space-occupying lesions.

Case Report

A 40-year-old male patient was hospitalized for one month with intermittent chest pain discomfort. Before one month, the patient had chest pain and discomfort without obvious inducement, which was confined to the right side of the sternum, about the size of a palm, and could not be significantly relieved after rest. The patient had no obvious cough, sputum, or throat irritation. The patient had no fever and no significant change in weight in the past six months. The patient has no pets and does not come into contact with special dust. The patient had never smoked and was rarely exposed to second-hand smoke. He had no drinking history, had not traveled recently, and had not undergone any recent dental work. He is a worker in good health, his mother has a history of lung cancer, and no other immediate family

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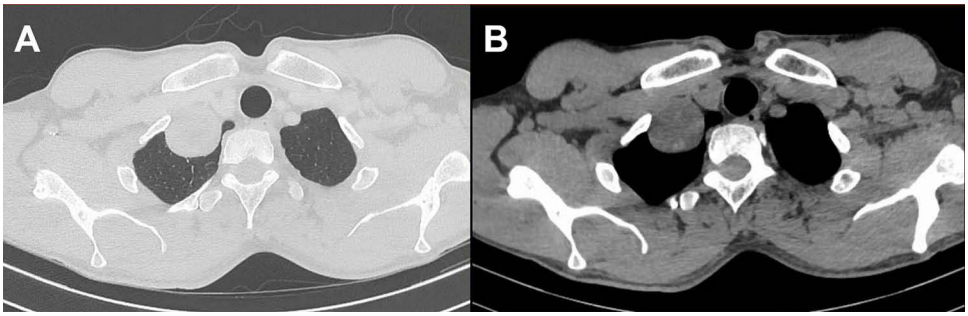

Figure 1 16-slice computed tomographic scan showed a mass image in the upper lobe of the right lung adjacent to the chest wall. The tubercle boundary was clear and the internal density was uneven. Careful examination showed that the mass had a pedicle. (**A**) Lung window; (**B**) Mediastinal window.

members have a history of cancer. Physical examination indicated that the patient's body temperature was 36.5°C, pulse rate was 84 times/min, respiration was 20 times/min, and blood pressure was 114/75mmHg. The patient was conscious, breathing was stable, superficial lymph nodes were not enlarged, the two lungs were silent on percussion, and the two lungs could not hear dry and wet rales on auscultation. The heart rate was 84 beats/min, the rhythm was smooth, and there was no noise. The abdomen is flat and soft, there is no tenderness, rebound pain or muscle tension in the whole abdomen, the liver, spleen and ribs are not touched, and the lower limbs are not edema.

This chest pain symptoms are somewhat relieved by oral Ibuprofen, but it quickly receded. The patient underwent chest computed tomographic (CT) scan examination, which revealed a 3.8 cm space occupying lesion in the upper lobe of the right lung (Figure 1). The lesion had clear boundaries and uneven internal density. The radiologist believes that it may be a benign lesion and it is preferred to be considered as a haematoma. Subsequently, this imaging diagnosis was discussed in depth at a group radiology imaging diagnosis meeting. A viewpoint that got enough attention was that this lung lesion should be diagnosed as a schwannoma, because the lesion boundary was clear and the internal density was uneven. What is more, the lesion had a tiny pedicle. Considering that the level of radiological diagnosis was relatively not the highest evidence, the discussion group recommended a histopathological diagnosis. Last, the lesion was eventually confirmed as a schwannoma by needle biopsy (Figure 2). The procedure of fine needle puncture was smooth,

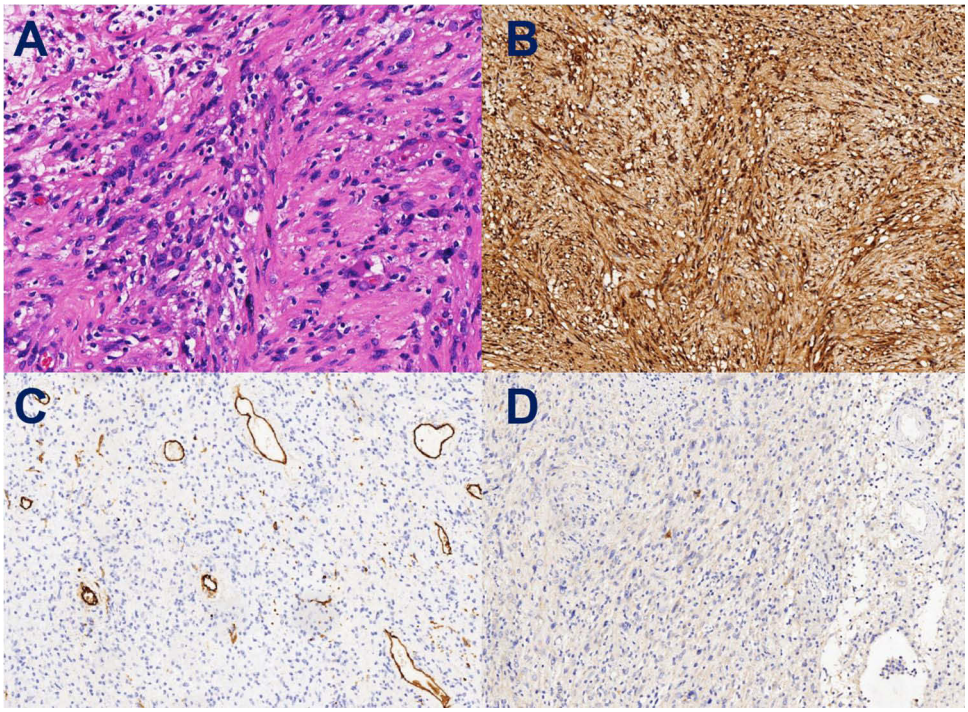

Figure 2 Image of histologic diagnosis from the mass. (**A**) HE × 200; (**B**) S100 × 100; (**C**) CD34 × 40; (**D**) EMA × 100.

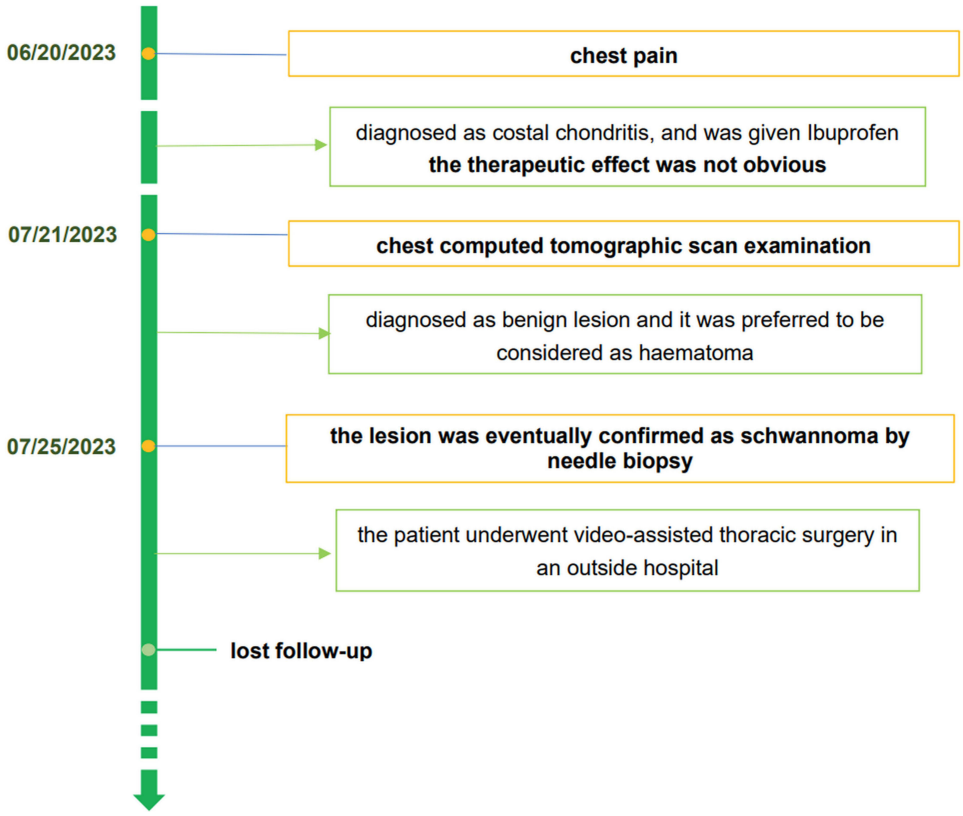

Figure 3 The timeline of the patient' disease evolution, diagnosis and treatments.

and there were no complications such as obvious bleeding and pneumothorax. After diagnosis by tissue histopathology, the patient underwent video-assisted thoracic surgery in an outside hospital and lost follow-up. The more holistic view of the case is shown in Figure 3.

Discussion

Schwannomas, also called as neurilemomas, or neurinomas, are benign, encapsulated, slow-growing tumours of neural origin.[6,7] The substance of this tumor is Schwann cells, which cover the axons of the nerves of peripheral, cranium, and autonomic nervous system.[7,8] Therefore, they are often grown in areas rich in the nervous system such as the neck, arms, posterior mediastinum, and retroperitoneum.[5,9] Although most visceral schwannomas are found on the posterior aspects of the human body, such as the posterior mediastinum and retroperitoneum, schwannomas in other internal organs have begun to be reported due to the refinement of radiographic scanning and the improvement of three-dimensional imaging algorithms. Lung is one of the rare sites for as noticed for schwannomas.[5,10,11] The incidence of lung schwannomas is extremely low, and only a few cases have been reported in the existing literature. Although the incidence is rare, it can occur in the lungs, bronchus, and near the pleura.[5,12,13] According to existing literature, they arise from autonomic nerve fiber sheaths in the pleural surface of the lung.[5,14,15]

The sporadic nature, delayed presentation, and nonspecific signs and symptoms of tumors make the diagnosis and reporting a daunting task.[16] Although they are suitable for surgery, preoperative clinical and radiographic findings have not been fully elucidated due to their rare location.[16] Misdiagnosis may change the established surgical methods and cause distrust and misunderstanding of doctors by patients and their families.[17] Therefore, it is necessary to report and analyze the challenging diagnosis of this rare case.

Lung schwannomas have been previously diagnosed as metastases based on CT images.[16] Thyroid metastasis, breast metastasis, and ovarian metastasis are all worthy of consideration. Primary tumors including retrosternal goiter, thymoma, and cardiac tumors should also be considered for diagnosis.[16,18] Diagnoses of schwannomas using magnetic resonance imaging (MRI), CT or ultrasound are challenging. On MRI, lung schwannomas typically show iso- to hypo-

intensity in T1 and hyperintensity in T2 and post-contrast enhancement in T1.[16] However, they are not specific to schwannomas, some lung cancers may also show these MRI findings. Schwannomas are characterized by round lesions that are iso- or hypoattenuated on CT scans, which was also the common feature of most benign lung lesions. Furthermore, although most schwannomas exhibit homogeneous contrast enhancement, some cases exhibit heterogeneous enhancement (intratumoral necrosis). It is difficult to differentiate schwannomas from gastrointestinal stromal tumours, lymph nodes, muscle-associated tumors on ultrasound.[16,19] When lung schwannoma is suspected, histopathological examination should be considered because imaging alone makes diagnosis difficult.[11,16]

The microscopic histological examination demonstrated the presence of proliferating Schwann cells characterized by spindle-shaped nuclei and pointed ends. Two distinct growth patterns were identified, namely Antony A (hypercellular, exhibiting nuclei foci arranged in a palisade-like manner referred to as Verocay bodies) and Antony B (hypocellular, displaying a loosely arranged structure).[5,20] The presence of palisading of nuclei is frequently observed in schwannoma, but it can also be found in other tumors such as gastrointestinal stromal tumours, leiomyosarcoma, leiomyoma, calcifying aponeurotic fibroma, and non-neoplastic smooth muscle lesions. Due to the infrequent occurrence of plexiform areas in schwannoma, they may be mistakenly diagnosed as neurofibroma. Some schwannomas exhibit high cellularity, pleomorphism, and mitotic activity, leading to potential misclassification as sarcomas.[5,20] Hence, immunohistochemistry (IHC) plays a supplementary role in distinguishing neural fusiform tumors. The utilized markers in IHC encompass CD34, CD56, CD117, S100, Calretinin, Vimentin, Desmin, EMA, and smooth muscle antigen. Notably, Calretinin exhibits high specificity for schwannomas while being absent in neurofibromas; CD56 is present in 77% of schwannomas. Conversely, CD34 is present in 80% of neurofibromas.[5] In contrast, the immunoreactivity to S100 protein appears similar in both schwannomas and neurofibromas.[5,11]

The reasons for the challenging diagnosis of this case on radiology imaging are analyzed as follows.[21] First of all, young non-smoking patients complained of intermittent chest pain, which could not be relieved after rest. Neurogenic pain should be considered first. Secondly, the patient's chest CT showed the shadow of an occupying lesion in the lung, near the pleura and anterior mediastinum. Careful examination of the radiology imaging showed that the lesion was pedicled and seemed to originate from the chest wall. A space-occupying lesion with such signs should be considered a musculoskeletal-type chest-related tumor. Thirdly, the internal density of the lesion is uneven, so it can be considered to exclude pleural mesothelioma or pleural fibroma, and haematoma, cancerous necrosis or schwannoma liquefaction should be considered. Finally, the boundary of the lesion was clear and benign. However, the analysis of the above reasons still cannot exclude the diagnosis that the lesion is a lung haematoma. Tissue histopathology is used to determine the diagnosis of lung schwannoma, whereas radiological evaluation just confirms the diagnosis.

Of course, the diagnostic analysis of CT images in this isolated case is limited. Future CT imaging diagnoses may draw on new tools such as artificial intelligence.[4] Nevertheless, it may be worthwhile to analyze the CT imaging diagnosis of this case.

In conclusion, this novel case highlights lung schwannoma as a differential diagnosis for patients with intermittent pain. The diagnostic lessons of chest CT reading to distinguish lung schwannomas from their similar diseases are also highlighted.

Data Sharing Statement

This is a case report without statistical analysis of the raw medical record data. All medical data involving the patient are documented in the patient's medical record. If necessary, more detailed imaging data or laboratory data can be provided to the corresponding authors or the first authors.

Ethics Statement

As the dissemination and promotion of medical experience, the patient was very willing to submit his case data to a professional journal. So, he has signed the informed consent to publish this case report. The written informed consent was signed by the patient to have the case details and any accompanying images published. This report complies with the guidelines for human studies and is in accordance with the Declaration of Helsinki. The ethics review committee of Renmin Hospital of Qingxian approved the use of clinical data of this patient in this study.

Informed Consent for Publication

The patient agreed to publish his medical data including imaging data and laboratory data and signed the informed consent.

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Disclosure

Cui-Ping Li, Lei Li, and Lin-Ming Su are co-first authors of this study. All the authors declare that they have no conflicts of interest in this study and have not received any financial support.

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