Persistent spontaneous pneumothorax as a primary manifestation of primary synovial sarcoma of the lung: a case report

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ABSTRACT

Pleuropulmonary synovial sarcoma (PPSS) is a primary malignancy of the lung, uncommon in pediatrics (prevalence: 0.1–0.5%) that predominantly affects adolescents and young adults. Overall survival has been reported to be close to 30% at 5 years.

Here we report the case of a previously healthy 12-year-old male patient who presented with cough, chest pain, and dyspnea of sudden onset as initial manifestation of left pneumothorax, which persisted after 4 days and required surgical resection of pulmonary bullous lesion. A histological diagnosis of pleuropulmonary synovial sarcoma was made and confirmed by molecular study, which showed chromosomal translocation between chromosomes X and 18: t(X;18) (p11.2;q11.2) in the surgical specimen removed.

In patients with persistent or recurrent pneumothorax, it is important to rule out secondary causes, including pleuropulmonary synovial sarcoma. Such poor prognosis determines the need for early diagnosis and aggressive treatment.

Key words: pneumothorax; bullae; lung malignancies; synovial sarcoma; pediatrics.
INTRODUCTION

Pneumothorax is defined as the presence of air in the pleural space that causes certain degree of lung collapse.\(^1\) It is rare in pediatrics, with an incidence of 4:100 000 males and 1.1:100 000 females.\(^2\)

Based on its etiology, it is classified into acquired or spontaneous, and the latter, into secondary or primary (with or without underlying lung disease).\(^3\) The most frequent type of pneumothorax is primary spontaneous pneumothorax in male, longinlineal individuals aged 10 to 30 years, and its main etiology is subpleural bullae.\(^2\) Secondary causes of pneumothorax include airway disease (asthma), post-infectious disease (necrotizing pneumonia, tuberculosis), cystic fibrosis, congenital pulmonary malformations, connective tissue diseases and, less frequently, neoplasms.\(^3\)

Primary malignancies of the lung are rare in pediatrics. The most frequent include pleuropulmonary blastoma, carcinoid tumor, and inflammatory myofibroblastic tumor. Synovial sarcoma (SS) is uncommon.\(^4,5\) It usually presents as a progressively growing periarticular tumor mass in the limbs.\(^6,7\) If SS occurs primarily in the lung, pleuropulmonary synovial sarcoma (PPSS) has a poor prognosis and, in general, an aggressive course.\(^8\)

Occasionally, pneumothorax has a poor course and is persistent or recurrent,\(^9,10\) which makes it necessary to perform studies to look for the underlying cause.

Here we describe the case of a child diagnosed with PPSS whose initial clinical manifestation was persistent spontaneous pneumothorax.

CASE REPORT

This was a 12-year-old male patient with no relevant personal history who consulted the emergency department due to sudden onset dyspnea, cough, and chest pain. He denied any history of trauma or other accompanying symptoms.

On admission, he was wakeful and connected, without fever (36 °C), had a regular general condition, normal blood oxygen level (SpO\(_2\) 95% with room air), tachycardia (HR: 96/bpm), tachypnea (RR: 30/bpm), normal blood pressure (95/60 mmHg) with peripheral pulses present, and hypoventilation in the left lung on pulmonary auscultation.

An anterior chest X-ray showed radiolucent left lung without a vascular pattern, with visceral pleural line delimiting pulmonary collapse, flattening of the left diaphragm, and slight displacement of the mediastinum towards the midline; the right lung was unaltered.

The diagnosis of grade 3, left hypertensive pneumothorax was confirmed (Figure 1).

The patient was hospitalized; supplemental oxygen was administered, and a pleural drainage tube (PDT) was placed; he showed clinical improvement and a complete left lung

Figure 1. Anterior chest X-ray on admission. Left pulmonary collapse secondary to grade 3, left hypertensive pneumothorax was observed
expansion was observed in the X-ray. He required supplemental oxygen for 2 days. The PDT was removed on day 3 due to his favorable course. However, 24 hours later, the patient reported sudden dyspnea with hypoxemia (SaO₂ 92% with room air) and left pneumothorax was confirmed by X-ray.

Given the persistence of the pneumothorax, a thoracoscopy was performed, which revealed apical bullae and scarce pleural fluid. The patient underwent apical lung resection and pleurodesis. Pulmonary and pleural tissue samples were taken for microbiological and pathological study.

Pending histological test results, tuberculosis was ruled out by tuberculin test (purified protein derivative, PPD) (0 mm) and 3 sputum samples negative for sputum smear and culture, as a secondary cause of pneumothorax. A high-resolution computed tomography (HRCT) of the chest without contrast was performed, which showed no alterations in the lung parenchyma, mediastinum, and bone structures.

The hematoxylin and eosin staining of the lung biopsy specimen evidenced the lung parenchyma was focally infiltrated by a dense, non-encapsulated, monomorphic cellular neoplastic proliferation consisting of elongated spindle cells with oval nuclei with granular chromatin and some prominent nucleoli, forming intertwined bundles. Up to 2 mitotic figures were recognized in more than 10 power fields (Figure 2). The immunolabeling techniques were positive for BCL-2, vimentin, CD99, and EMA; fluorescent in situ hybridization (FISH) and reverse transcription polymerase chain reaction (RT-PCR) were also done and showed a translocation between chromosomes X and 18: t(X;18) (p11.2;q11.2), confirming the diagnosis of SS.

The patient was hospitalized for 10 days, required 5 days of supplemental oxygen, and presented a good clinical course. He was followed-up by the Department of Oncology. The stage of SS was established, and the possibility of it being a metastasis from another primary site was ruled out through HRCT of the chest, abdomen, and central nervous system, positron emission tomography (PET), and bone scan.

Considering the prognostic factors associated with this disease, it was concluded that, although the tumor measured < 5 cm and had a post-operative IRS-I classification (Intergroup Rhabdomyosarcoma Study Group classification: complete resection with negative margins)—both favorable prognostic factors for SS—, its axial location categorized it as a high-risk patient. He received treatment according to the EpSSG RMS 2005 protocol for patients with high-risk SS, which includes chemotherapy with alkylating agents and anthracyclines (ifosfamide-doxorubicin) together with the need for consolidation of local treatment with radiotherapy. He did not present any major complications during treatment and is currently in complete remission, receiving the corresponding follow-up.

**DISCUSSION**

Primary lung tumors in children are rare and less frequent than lung metastases.4,5

**Figure 2.** High-resolution computed tomography of the chest. No evidence of parenchymal, mediastinal, or bone lesions.
SS is a malignant tumor of mesenchymal origin that, despite its name, is not related to synovial tissues. It accounts for 8% of soft tissue sarcomas. SS is most frequently located in the limbs, although it may also have an axial location (head, neck, abdominal wall, retroperitoneum, mediastinum, or pleuropulmonary), which is associated with a worse prognosis and requires more intensive treatment, as in the case of our patient.

PPSS is an uncommon form of SS and accounts for 0.1–0.5% of lung tumors; the few cases described so far are aggressive and affect adolescents and young adults. PPSS manifests most frequently as an asymptomatic lung mass or with chest pain, cough, dyspnea, and even hemothorax. On chest X-ray, it is seen as a well-defined, rounded-edged lung or pleural mass usually accompanied by ipsilateral pleural effusion. On HRCT of the chest, it is seen as a mass with heterogeneous enhancement and well-delimited borders, without bone involvement or calcifications inside. Less frequently, PPSS presents as persistent or recurrent pneumothorax due to rupture of a cystic or bullous pulmonary lesion, as evidenced by the clinical case reported here. Such lesion characteristics warrant a differential diagnosis with benign cysts, type 1 pleuropulmonary blastoma, mesenchymal cystic hamartoma, and lymphangioleiomyomatosis.

Diagnostic suspicion is confirmed by a pathological study of the pleuropulmonary tissue. Histopathology classifies it into monophasic or biphasic. The following positive markers may be identified through immunohistochemical labeling: vimentin, cytokeratin, EMA, and BCL-2. In more than 90% of cases, patients have a translocation between chromosomes X and 18: t(X;18) (p11.2;q11.2), which results in the fusion of the SYT gene on chromosome 18 and the SSX1 or SSX2 genes on chromosome X. Its presence constitutes a specific marker of SS and can be detected by FISH or molecular biology techniques, such as RT-PCR. As mentioned in our clinical case, our patient had positive findings in the immunolabeling techniques and the molecular chromosomal study.

The first-line treatment is surgical resection associated with chemotherapy, radiotherapy or both, as indicated in our patient, based on tumor staging.

The overall 5-year survival of adolescent patients with localized SS exceeds 80%; however, in the case of PPSS, this figure decreases to 30%. Axial location, difficult complete resection, large size (> 5 cm), and the presence of metastasis are poor prognostic factors for PPSS. These cases show a more aggressive clinical course and high rates of both local and metastatic recurrence, which ultimately compromise the patient’s life.

Figure 3. Hematoxylin and eosin staining. Atypical, non-encapsulated, monomorphic cellular proliferation, with elongated spindle cells with scant cytoplasm.
Although PPSS has a poor prognosis, our patient’s course has been favorable so far, thanks to the multidisciplinary approach that allowed a timely diagnosis and treatment.

CONCLUSION

Few data have been published in the international bibliography on pediatric patients with PPSS and, to date, no cases with this presentation have been published in our country. In patients with persistent or recurrent pneumothorax, it is important to rule out secondary causes. The ominous prognosis of PPSS determines the need for early diagnosis and aggressive treatment.

REFERENCES