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Case Report

Common Presentation of Uncommon Disease: Inflammatory myofibroblastic tumor of the lung, case report

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ABSTRACT

Background: Inflammatory myofibroblastic tumor (IMT) of the lung is a rare lung tumor, accounting for 0.7% of all lung tumors. They are usually benign, but can invade surrounding structures, undergo malignant transformation, recur, or even metastasize.
Case report: We report a 44-year-old adult diabetic male from Saudi Arabia who had been suffering from cough with severe sputum and left shoulder pain for 2 weeks. Chest radiography (X-ray and computed tomography (CT)) revealed the presence of a mass lesion in the left lower upper lobe with central cavitation. The diagnosis of inflammatory myofibroblast lung tumor was confirmed by histological and immunohistochemical examination of the CT guided lung biopsy. The patient was successfully treated with surgical resection of the tumor by left limited thoracotomy with safety margin, and IMT was also documented.
Conclusion: A high degree of suspicion of a solitary pulmonary mass is required for diagnosis and management of an inflammatory myofibroblastic lung tumor. The clinical and radiologic presentation of an inflammatory myofibroblastic tumor is nonspecific and the diagnosis is rarely made before surgical biopsy. Histologic and immunohistochemical examination is usually required to confirm the diagnosis and prevent recurrence.

1. Introduction

Inflammatory myofibroblastic tumor (IMT) of the lung is a rare lung tumor, accounting for 0.7% of all pulmonary neoplasms [1,2]. However, it's more common in children and constitutes the most common pediatric primary lung tumor [3]. They are usually benign and cured by complete resection, but it can invade surrounding structures, undergo malignant transformation, recur or even metastasize [1,2]. It was first described by Brunn in 1939 [4]. IMT has been described by various terms due to its variable cellular components, including plasma cell granuloma, inflammatory pseudotumour, and fibrous histiocytoma. The view that IMT is a reactive lesion or a neoplasm has been controversial [5].

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2. Case presentation

A 44 years old, Saudi male, married, ex-smoker for 4 years, with a smoking index of 10 packs/year. He has Type 2 diabetes for 10 years and takes basal insulin, metformin and sitagliptin. He has dyslipidemia on statins and vitamin D deficiency.

He had a productive cough for 2 weeks with large quantities of odorless yellow sputum, with intermittent pain in the left shoulder for 3 days. He denied fever, dyspnea, hemoptysis, or diarrhea. He denied any history of choking or dental caries.

The general examination was unremarkable. Local chest examination was positive for dullness in the left upper chest with fine inspiratory rales.

Chest x-ray showed opacity in the left hilum and para-hilar area (Fig. 1a). CT chest without contrast showed a soft tissue mass in the left upper lobe (lingual) with central necrosis (Fig. 2a, b).

Since he is diabetic and pulmonary tuberculosis is relatively common in our area, he was admitted to a negative pressure isolation room until tuberculosis can be confirmed or ruled out.

He was treated with intravenous amoxicillin and clavulanic acid as a case of pulmonary abscess and further investigations were performed. Sputum for acid fast bacilli 3 samples by stain and polymerase chain reaction were negative for tuberculosis as well as sputum Grams stain and culture were negative. The situation improved at first, as the chest pain subsided and the sputum became less and whiter. He was discharged after 3 days on oral co-amoxclave and ordered to follow up in the clinic after 10 days.

After a week he came for follow-up, complaining only of hemoptysis, a small amount of bloody sputum, with no other symptoms. Subsequent chest radiograph revealed persistent opacity of the left upper lobe and CT thorax showed 2.2 × 2.5 cm subpleural cavitary nodules in the left upper lobe/lingula associated with an adjacent area of patchy languor, minimal interlobular septal thickening, and tree-in-bud nodules (Fig. 2c, d).

He underwent a CT guided lung biopsy to diagnose the etiology, possibly lung cancer, and the procedure was performed as a day case under local anesthesia without complications (Fig. 2e)

A diagnosis of inflammatory myofibroblastic tumor of the lung was rendered based on histopathology evaluation and a panel of immunohistochemistry stains (Fig. 3a-e).

Sections of the tumor sampled in the core biopsy revealed spindle cells in a background of abundant mixed inflammatory infiltrate rich in plasma cells, lymphocytes, and few eosinophils. The spindle cells are arranged in fascicles. The immunohistochemistry stains revealed that the spindle cells were positive for Actin. They are negative for pankeratin, S100, CD68 and Alk1. The plasma cells in the background are proven to be polyclonal using Kappa and Lambda immunohistochemistry staining.

A follow-up CT thorax with contrast was performed to assess the size of the mass, other lung areas, and the mediastinum preoperatively (Fig. 2-f).

A multidisciplinary team of pulmonology, oncology, thoracic surgery, and radiology was consulted and the decision was made to perform a surgical resection with a safety margin and rapid incision. A limited left thoracotomy was performed and a wedge resection with safety margin was performed. The resected lung lesion was confirmed by histopathological and immunohistochemical examinations as IMT of the lung.

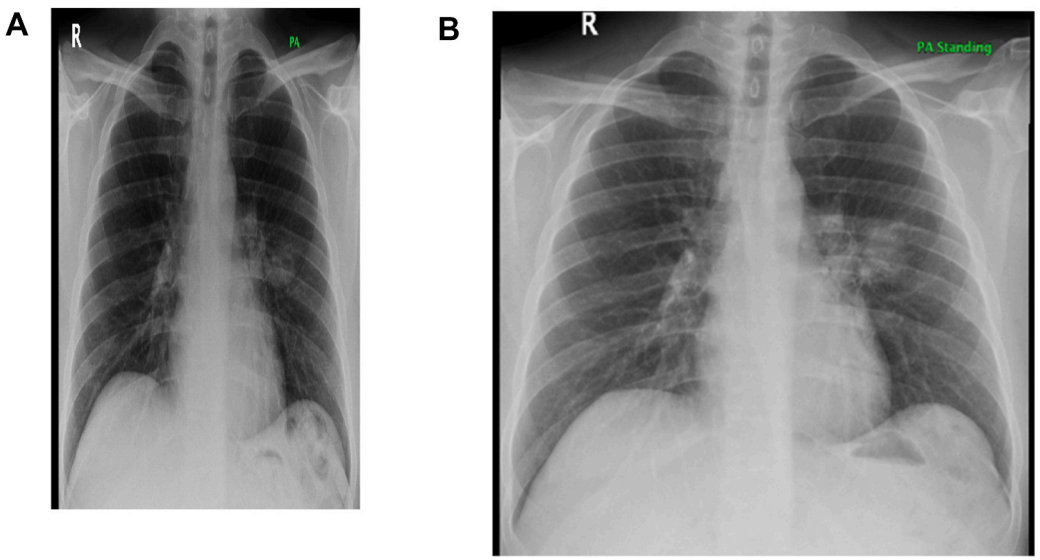

Fig. 1. Chest x –ray posteroanterior view 23-August-2021: left paracardiac opacity with ill-defined margin and this appearance of the internal gas.
Fig. 1b: Chest x –ray posteroanterior view 13-Sep-2021: Slight Progressive size of the previously noted left paracardiac opacity with ill-defined margin and this appearance of the internal gas

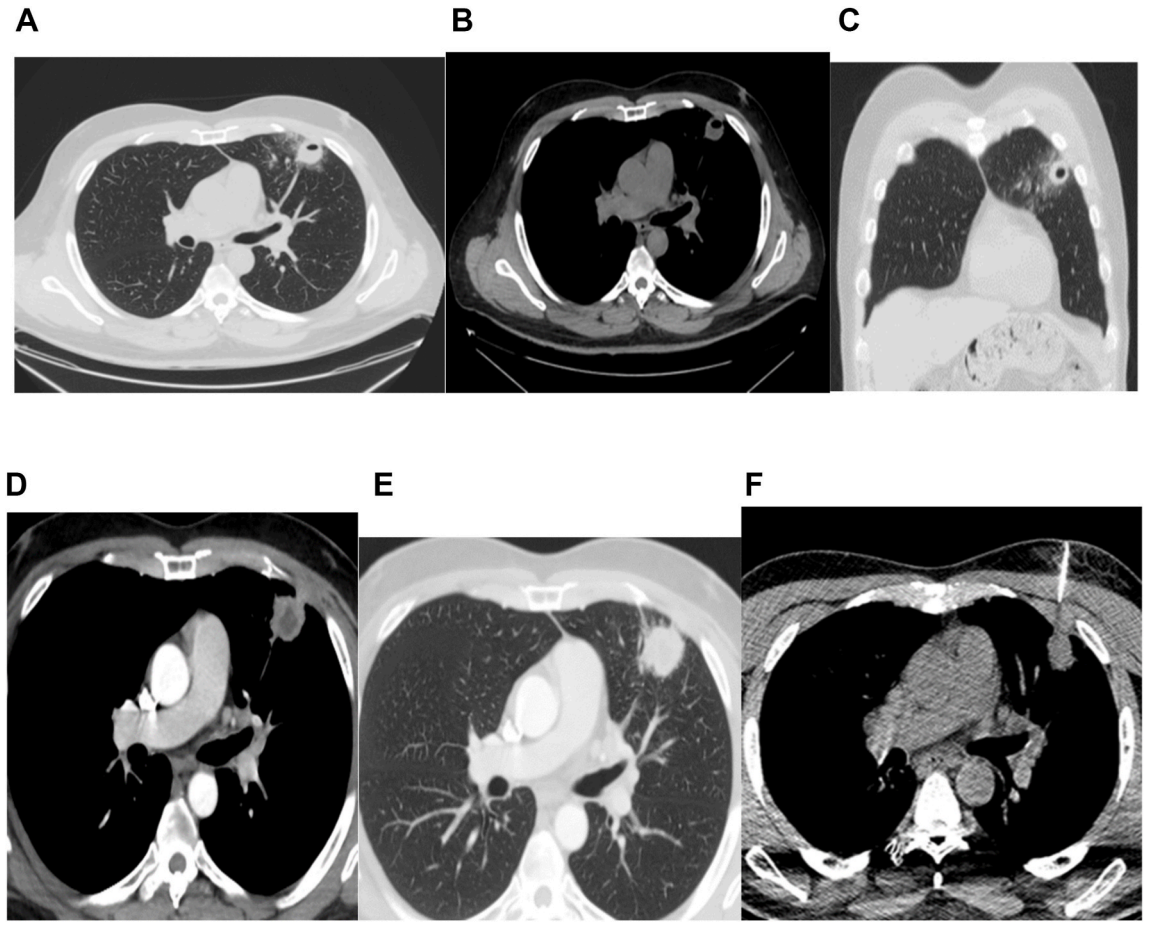

Fig. 2. CT thorax lung window, 2b mediastinal window, 2c lung window coronal section 23-August-2021: A 2.2 × 2.5 cm subpleural cavitary nodule is seen in the anterior aspect of the left upper lobe/lingula, with an adjacent area of patchy ground glass opacity, minimal interlobular septal thickening, and tree-in-bud nodules. Fig. 2b
Fig. 2c.
Fig. 2e
Fig. 2d CT thorax mediastinal window, 2e lung window 23-August-2021: Interval growth of the subpleural mass in the left upper lobe of the anterior segment with interval growth of the associated left perivascular lymph nodes compared with the previous CT scan of August. Size is unchanged from the previous CT of September. Fig. 2f CT thorax mediastinal window 23-Sep-2021: At CT, a true incisional needle biopsy was taken from a subpleural round lesion in the left upper lobe. The procedure was performed under local anesthesia without complications.

3. Discussion

The lung is one of the most common locations of IMTs, accounting for only about 0.7% of all lung tumors in the general population [1,2]. Sites outside the lung have also been reported, including the spleen, lymph nodes, stomach, esophagus, salivary glands, breast, central nervous system, epididymis, and soft tissues [4,5]. They may be associated with immunologic disorders [1] and chronic infections [6] and may occur in surgical lung scars.

The clinical and radiological manifestations are varied and non-specific. Therefore, it is difficult to establish the diagnosis unless surgical resection is performed [7]. They are usually asymptomatic and discovered incidentally as an abnormal chest radiograph, perhaps with nonspecific respiratory symptoms such as cough, chest pain, dyspnea, hemoptysis, and nonspecific inflammatory symptoms such as fever, malaise, and weight loss [1,2,6].

Radiological findings of pulmonary IMTs are nonspecific and may be solitary, well-circumscribed peripheral lung masses [8], with a predominance of lower lobes [9]. Aggressive behavior with invasion of adjacent structures has been described at CT [9]. The literature review seems to support a neoplastic origin for IMT with intermediate malignant potential in a small subset of cases described in the most recent World Health Organization classifications [10]. Cavitations - as in our patient - calcifications and lymphadenopathy are rare. In our case, neoplastic and infectious (bacterial, fungal and tuberculous) causes were initially excluded.

The diagnosis of IMT is difficult to make, and histological examination of the tissue is always required [11]. Transthoracic fine-needle aspiration biopsy and bronchoscopic specimens are usually too small and insufficient for a definite diagnosis [10]. Therefore, surgical excision of the lesion is the preferred method of diagnosis [12].

On macroscopic examination, the tumor is well circumscribed but not encapsulated, a yellowish gelatinous mass, firm and

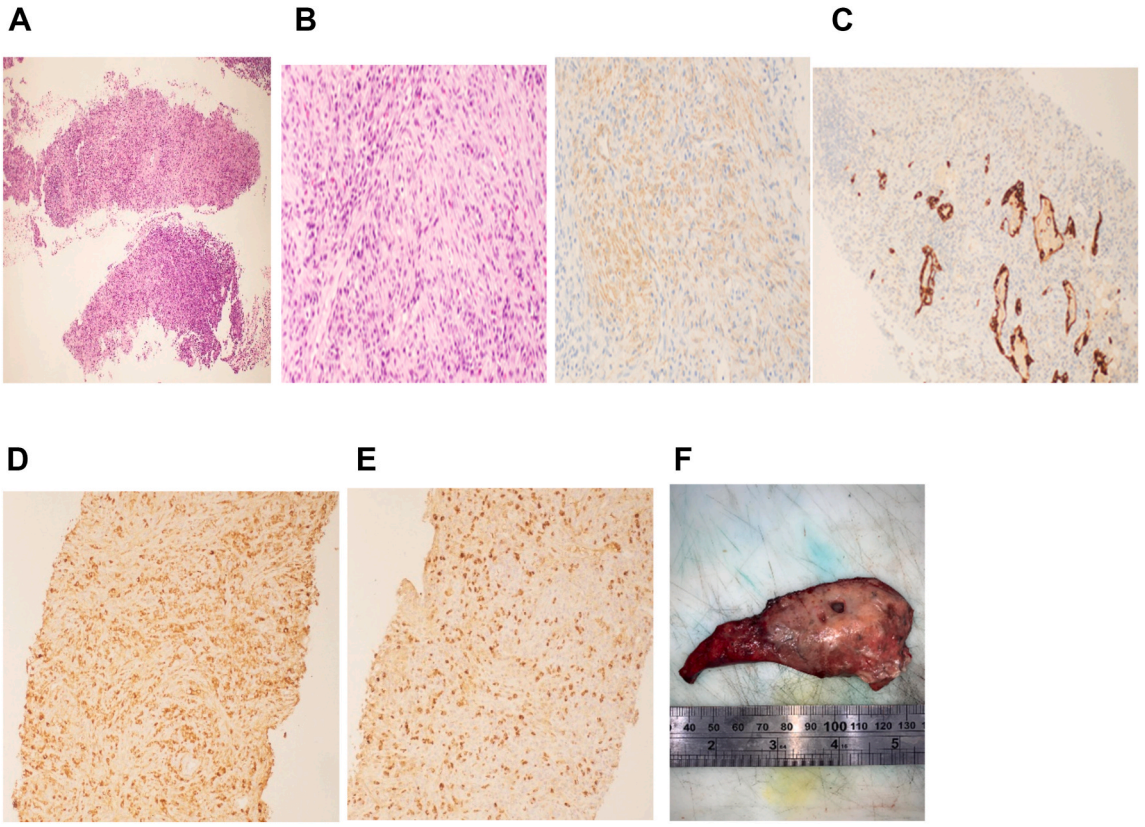

Fig. 3. On low power magnification (X4 objective) the core biopsy shows representative areas of the targeted lung mass. The tumor is hypercellular and not forming epithelial acini or cohesive sheets.
Fig. 3b: On high power magnification (X20 objective) there are spindle cells arrayed in fascicles, mixed with inflammatory cells including numerous plasma cells. These spindle cells show myofibroblastic differentiation by immunohistochemistry.
Fig. 3c: Smooth muscle actin is positive in the cytoplasm of the spindle cells supporting the myofibroblastic differentiation.
Fig. 3d: Pancytokeratin immunohistochemistry stain is negative in the spindle cells. The cytokeratin highlighted the epithelial cells in the entrapped airways.
Fig. 3e: Kappa (right side) and lambda (left side) immunohistochemistry stains show polyclonal population of plasma cells.
Fig. 3f: Wedge lung resection from the left upper lobe measuring 9.8-/4.9/3.2 cm, multiple stapled margin present. Well defined subpleural mass solid, 4/2.5/3.2 cm with cystic area 1.5/1.2/1.3 cm with free safety margin.

homogeneous, with sometimes some foci of necrosis, hemorrhage or calcification [13]. IMT is considered a neoplasm with intermediate biological potential that can recur and rarely metastasize. IMTs histologically consist of a variable mixture of fibroblasts, fibrous tissue, granulation tissue, and inflammatory cells. Immunohistochemistry is typically diffusely positive for actin, locally positive for FXIIIa, and negative for CD34 [14]. Histological examination revealed a variable proportion of myofibroblastic cells arranged in a myxoid, fibrous, or calcified stroma associated with a chronic inflammatory component including lymphocytes, plasma cells, and eosinophils distributed to varying degrees throughout the tumor [12,13].

Recent studies concluded that IMT is a true neoplasm rather than an inflammatory reactive lesion and reported that chromosomal abnormalities correlate with tumor incidence [13,15]. Approximately half of IMTs have a clonal abnormality overexpressing ALK, suggestive of a neoplastic process [16]. The main pathology differential diagnoses are organizing pneumonia, lymphoma, sarcoma, and fibrosis, but the pathologist is usually able to rule out malignancy [17].

A surgical lung biopsy is usually required to confirm the diagnosis, but a CT guided lung biopsy may also be diagnostic. Surgical resection (lobectomy and pneumonectomy) is the treatment of choice for IMTs to rule out malignancy and achieve cure. Spontaneous regression may occur, but local spread may be associated with significant morbidity and occasionally death. Complete surgical resection has an excellent prognosis with a low recurrence rate and a 5-year survival rate of more than 91%. When surgical resection is not possible, other treatments (radiotherapy, chemotherapy, or systemic corticosteroids) may be used as an alternative to surgery [9,10,12,15]. Chemotherapy is indicated in cases of multifocal, invasive lesions or in unresectable recurrent tumors [18]. The combined chemotherapy, carboplatin and paclitaxel, have shown response in some cases [19]. The use of corticosteroids for IMTs is controversial, with some studies showed good response and others have reported worsening of IMTs with steroids [20,21]. Tyrosine kinase inhibitors (Ex: ALK RT inhibitors and ROS-1 TK inhibitors) have been reported to be effective in advanced or unresectable ALK-rearranged IMTs or harboring ROS1kinase fusions [22,23].

Prognosis depends on the quality of surgical resection and tumor size [9,18]. After radical resection, the prognosis is excellent [11,18]. Even many years after the initial diagnosis, the disease may relapse. For this reason, patients should be monitored closely after

resection to detect local or distant recurrence [24,25].

The current case is unique in several ways; first the Common Presentation of Uncommon Disease: Inflammatory myofibroblastic tumor of the lung. Second, this would be the first case of inflammatory myofibroblastic tumor of the lung to be reported in Saudi Arabia.

4. Conclusion

Inflammatory myofibroblastic tumor is a rare benign tumor. The clinical and radiological presentation is variable and nonspecific. The diagnosis is rarely made before surgical treatment. Only histological and immunohistochemical examination can confirm the diagnosis. Although it is a benign lesion, its potential for recurrence and local invasion requires complete surgical resection.

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Declaration of competing interest

The authors have no conflict of interest to declare.

References

[1] J.E. Cantera, M.P. Alfaro, D.C. Rafart, et al., Inflammatory myofibroblastic tumors: a pictorial review, Insights Imaging 6 (1) (2015) 85–96, https://doi.org/10.1007/s13244-014-0370-0.
[2] M. Toge, M. Segawa, Y. Kusajima, K. Saito, D. Inoue, Y. Doki, N. Yoshimura, Immunoglobulin G4-related inflammatory pseudotumour of the lung, Kyobu Geka 65 (2012) 542–545.
[3] T. Patankar, S. Prasad, A. Shenoy, et al., Pulmonary inflammatory pseudotumour in children, Australas Radiol 44 (3) (2000) 318–320.
[4] I. Pinillaa, Y. Herreroa, M.I. Torresa, M. Nistalb, M. Pardoa, Tumor inflamatorio miofibroblástico pulmonary, Radiologa 49 (2007) 53–55, https://doi.org/10.1016/S0033-8338(07)73718-9.
[5] H. Racil, S. Saad, J. Ben Amar, S. Cheikh Rouhou, N. Chaouch, M. Zarrouk, A. Chabbou, Pseudotumeur inflammatoire pulmonaire invasive, Revu Méd interne. 32 (2011), e55 e58.
[6] Y. Braham, A. Migaou, M. Njima, A. Achour, A. Ben Saad, S. Cheikh Mhamed, N. Fahem, N. Rouatbi, S. Joobeur, Inflammatory myofibroblastic tumor of the lung: a rare entity, Respir Med Case Rep 31 (2020 Nov 11) 101287, https://doi.org/10.1016/j.rmcr.2020.101287. PMID: 33251105; PMCID: PMC7683262.
[7] J. Loeffler-Ragg, J. Bodner, M. Freund, et al., Diagnostic and therapeutic challenges of a large pleural inflammatory myofibroblastic tumor, Case Reports in Pulmonology 2012 (2012) 5. Article ID 102196.
[8] Y. Kaitoukov, G. Rakovich, S. Trahan, J. Grégoire, Inflammatory pseudotumour of the lung, Can Respir J 18 (2011) 315–317.
[9] A.E.S. Sagar, C.A. Jimenez, V.R. Shannon, Clinical and histopathologic correlates and management strategies for inflammatory myofibroblastic tumor of the lung. A case series and review of the literature, Med. Oncol. 35 (2018).
[10] Y. Na, S. Park, Inflammatory myofibroblastic tumor of the pleura with adjacent chest wall invasion and metastasis to the kidney: a case report, J. Med. Case Rep. 12 (2018).
[11] R. Sachdev, I. Mohapatra, S. Goel, K. Ahlawat, N. Sharma, Core biopsy diagnosis of alk positive inflammatory myofibroblastic tumor of lung: an interesting case, Turk. J. Pathol. 36 (2018) 173–177.
[12] N. Marwah, N. Bhutani, S. Dahiya, R. Sen, Inflammatory pseudotumour: a rare tumor of lung, Ann Med Surg 36 (2018) 106–109.
[13] C. Chien-Kuang, J. Chia-Ing, T. Jian-Shun, H. Hsu-Chih, C. Pin-Ru, L. Yu-Sen, C. Chih-Yi, F. Hsin-Yuan, Inflammatory myofibroblastic tumor of the lung- a case report, J Cardiothorac Surg 5 (2010) 55, https://doi.org/10.1186/1749-8090-5-55.
[14] R. Chauhan, K. Sodhi, R. Nada, R. Virk, J. Mathew, Pediatric inflammatory myofibroblastic tumor of the trachea: imaging spectrum and review of literature, Lung India 35 (2018) 516.
[15] I. Vázquez, A. Sánchez-Font, V. Curull, L. Pijuan, Inflammatory myofibroblastic tumor diagnosed by transbronchial needle aspiration, Arch. Bronconeumol 54 (2018) 43–44.
[16] M. Ogata, Y. Hatachi, T. Ogata, H. Satake, Y. Imai, H. Yasui, Effectiveness of crizotinib for inflammatory myofibroblastic tumor with ALK mutation, Intern. Med. 58 (2019) 1029–1032.
[17] L.D. Narla, B. Newman, S.S. Spottswood, S. Narla, R. Kolli, Inflammatory pseudotumor Radiographics 23 (3) (2003) 719–729.
[18] M. Peretti, D.M. Radu, K. Pfeuty, A. Dujon, M. Riquet, E. Martinod, Surgical resection of pulmonary inflammatory pseudotumors: long-term outcome, Asian Cardiovasc. Thorac. Ann 25 (2017) 440–445.
[19] N. Kubo, T. Harada, S. Anai, et al., Carboplatin plus paclitaxel in the successful treatment of advanced inflammatory myofibro- blastic tumor, Intern Med 51 (17) (2012) 2399–2401.
[20] T. Shirakusa, T. Kusano, R. Motonaga, et al., Plasma cell granulo- ma of the lung — resection and steroid therapy, Thorac Cardio- vasc Surg 35 (3) (1987) 185–188.
[21] S. Panigada, O. Sacco, D. Girosi, et al., Corticosteroids may favor proliferation of thoracic inflammatory myofibroblastic tumors, Pediatr Pulmonol 49 (3) (2014) E109–E111.
[22] B. Hallberg, R.H. Palmer, Mechanistic insight into ALK receptor tyrosine kinase in human cancer biology, Nat Rev Cancer 13 (10) (2013) 685–700.
[23] C.M. Lovly, A. Gupta, D. Lipson, et al., Inflammatory myofibro- blastic tumors harbor multiple potentially actionable kinase fusions, Cancer Discov 4 (8) (2014) 889–895.
[24] R. Chauhan, K. Sodhi, R. Nada, R. Virk, J. Mathew, Pediatric inflammatory myofibroblastic tumor of the trachea: imaging spectrum and review of literature, Lung India 35 (2018) 516.
[25] T. Tsuchiya, M. Tanaka, Pulmonary inflammatory myofibroblastic tumor: a case report, Asian Cardiovasc. Thorac. Ann. 26 (2018) 317–319.