Case Report

Bilateral Spontaneous Pneumothorax in a 15-Year-Old Child

Sameer Bansal, Vinaya S. Karkhanis and Jyotsna M. Joshi

Department of Pulmonary Medicine, T.N. Medical College, B.Y.L. Nair Hospital, Mumbai, India

Abstract

A 15-year-old boy presented with bilateral spontaneous pneumothorax and diabetes insipidus.

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Key words: Pneumothorax, Langerhans' cell, Lung, Skin lesions, Chemotherapy.

Introduction

Langerhans' cell histiocytosis (LCH) is an uncommon disease with insidious onset, and includes a spectrum of diseases characterised by uncontrolled proliferation and infiltration of various organs by Langerhans' cells.[1] It may involve various organ systems including skin, bone, pituitary gland, lymph nodes, liver and lungs. When lungs are the sole organ or the predominant organ of involvement, the disease is termed as pulmonary LCH (PLCH). LCH is more common in children, with predominantly cutaneous and bone manifestations, however, in adults, pulmonary involvement is more common, and frequently it may be the sole organ involved.[2] Here, we present the case of a 15-year-old boy with PLCH.

Case Report

A 15-year-old boy who developed bilateral pneumothorax, treated at another hospital was referred to our department with bilateral intercostal drains (ICD) in place for further management. He had history of dry cough and dyspnoea since two days with additional complaints of polydipsia and polyuria since the preceding one month. He was a non- smoker. Both parents were human immunodeficiency virus (HIV) positive. Physical examination revealed tachypnoea (respirations 28/min) and tachycardia (pulse 110/min); blood pressure was within normal range. Breath sounds were diminished in bilateral hemithorax and bilateral crepititions were heard over lung bases. There were papulo-erythematous, seborrhetic skin lesions over face and trunk, and Marfanoid features in form of high arched palate, positive thumb and wrist signs, and arm span greater than height. Arterial blood gas (ABG) while breathing room air was within normal limits. Laboratory examination revealed elevated serum hepatic transaminases (serum aspartate aminotransferase 75U/L; serumn alanine aminotransferase 70U/L) and elevated serum gamma-glutamyl transferase (GGT) (312IU/L). Serological testing for HIV was non-reactive. An overnight water deprivation test was suggestive of central diabetes insipidus.

Chest radiograph showed bilateral diffuse cystic lesions with bilateral pneumothorax with intercostals tubes in position on both sides (Figure 1). Spirometry was suggestive of restrictive abnormality with a forced vital capacity (FVC) 41% predicted, forced expiratory volume in one second (FEV_1) 40% predicted and FEV_1/FVC ratio 79%. High resolution computed tomography (HRCT) of the thorax (Figure 2) showed bilateral diffuse lung cysts, with bilateral pneumothorax, and a few subcentimeter sized hepatic cysts. Radiograph of skull was normal. Magnetic resonance imaging (MRI) of the head showed neovascularisation of posterior pituitary bright spot (PPBS), and a thickened pituitary stalk, suggestive of lymphocytic hypophysitis.

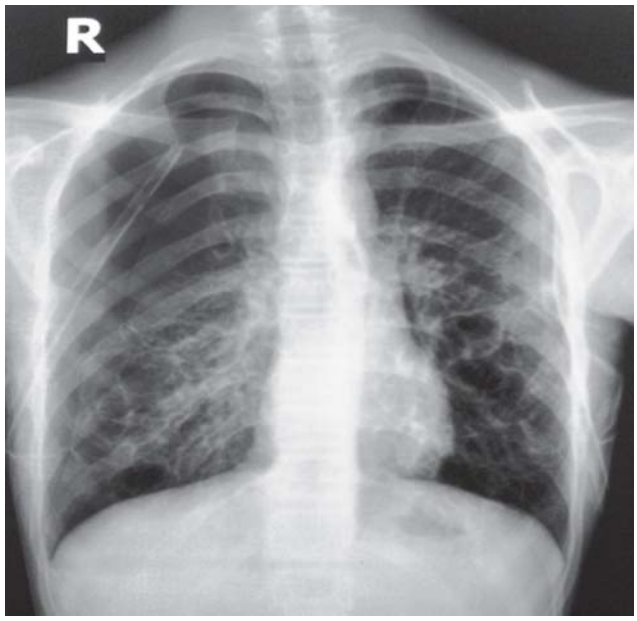

Figure 1. Chest radiogaph (postero-anterior view) showing bilateral pneumothorax with bilateral diffuse cystic opacities with ICD *in situ*.

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Correspondence and reprint requests: Dr J.M. Joshi, Professor and Head, Department of Pulmonary Medicine, T.N. Medical College and B.Y.L. Nair Hospital, Mumbai-400 008 (Maharashtra), India; E-mail: drjoshijm@gmail.com

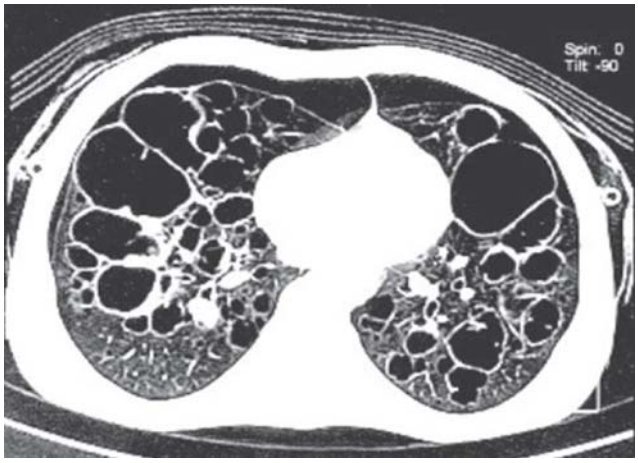

Figure 2. High resolution computed tomography of thorax showing presence of diffuse cystic lesions with bilateral pneumothorax.

Two-dimensional echocardiography was normal. Abdominal ultrasonography showed hepatic cysts, and increased echogenicity of portal radicals with a starry sky appearance. Magnetic resonance cholangiopancreatography (MRCP) revealed simple hepatic cysts in segments IV and VIII of the liver. A percutaneous needle liver biopsy showed intra-hepatic cholestatic changes; immunohistochemistry (IHC) markers (S-100 and CD1a) tested negative. Skin biopsy showed perivascular infiltrate of lymphocytes and plasma cells, but no histiocytes and was negative for IHC markers. Positron emission tomography-computed tomography (PET-CT) showed metabolic activity only in focal cystic lesion of the right upper lobe. A CT-guided biopsy obtained from the FDG avid lesion in the lung revealed Langerhans' cells in the interstitial spaces with eosinophils and tested positive for CD-1a and S-100 (Figures 3A and B), and a diagnosis of PLCH was confirmed. Oral desmopressin (0.5mg) was started for the symptoms of polyuria and polydipsia along with chemotherapy constituting vinblastine, etoposide and prednisolone. Unfortunately, the patient died due to respiratory failure, two months after starting the therapy.

Discussion

Langerhans' cell histiocytosis is a rare and a challenging disease which may manifest in a variety of ways, ranging from a spontaneously regressing solitary lesion of bone to a multi-system, life-threatening disorder.[1] Solitary bone involvement, usually skull is the most common presentation with excellent outcomes. Most common skin presentation is a 'seborrhea-like' eruption, which may or may not be purpuric. Other skin manifestations include papules, vesicles, crusted plaques, nodules and purpuric nodules.[3] Overall diabetes insipidus occurs in about 24% patients and is more common in patients with multi-system LCH.[4]

This well-documented case illustrates a rare presentation of PLCH with extra-pulmonary pituitary involvement in a child. PLCH develops predominantly in adults, cigarette smokers, probably due to various chemicals in the cigarette smoke.[5] PLCH generally has an insidious onset and often progressive course that makes determination of its time of onset very difficult.[6] The early pathologic lesion may be a bronchiolitis which progresses to intra-luminal fibrosis and elastic fiber degradation and lung remodelling.[7] Pulmonary symptoms and spontaneous pneumothorax most likely are late symptoms, and reflect a more advanced disease.[8] Regular cigarette smoking seems to be a very strong promoter of PLCH, and smoking cessation forms an integral part of management of such patients.[9] Our patient was non-smoker and presented with acute onset symptoms due to bilateral pneumothorax. Pneumothorax generally has high recurrence rates and pleurodesis is recommended, if there are more than two recurrences.[10] In one study,[11] ipsilateral recurrence was as high as 58% when pneumothorax was treated with tube thoracostomy alone, but was nil when pleurodesis was performed. In pulmonary as well as extra-pulmonary LCH, FDG-PET has been

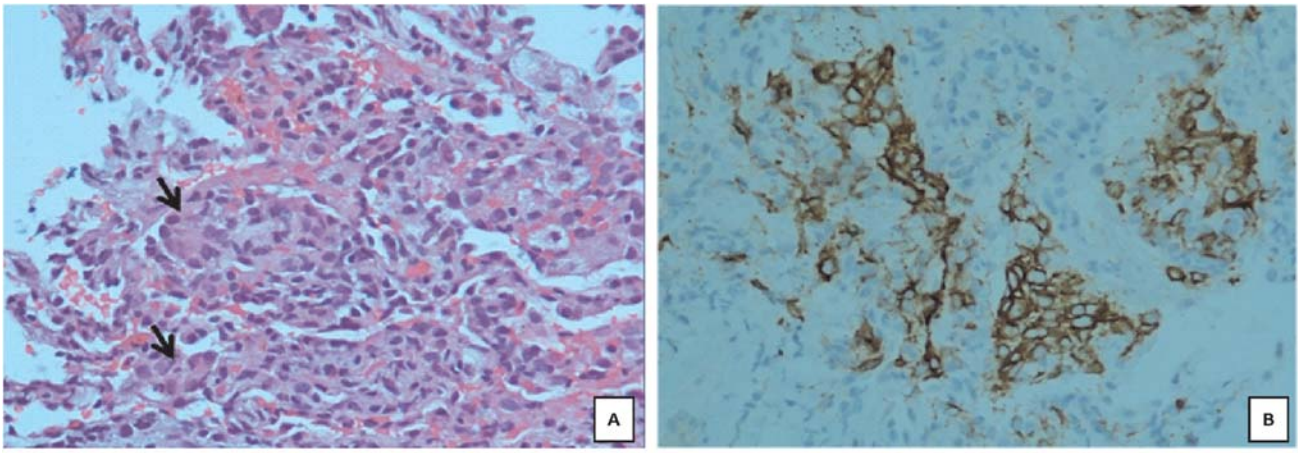

Figure 3. Photomicrograph of lung biopsy showing (A) intra-alveolar clusters of Langerhans' cells (arrows) (haematoxylin and eosin × 400) and (B) immunohistochemistry (CD1a) highlighting Langerhans' cells (avidin biotin complex × 400).

found to be useful. In one study,[12] FDG-PET scans identified 35% more lesions than plain films, bone scans, MRIs, or CTs. In another study[13] of 11 PLCH patients, with abnormal PET findings, it was demonstrated that positive PET findings were more likely in patients with early disease associated with predominantly nodular chest CT scan findings. The FDG uptake occurred in discrete solid nodules, regions of dense, small nodularity (<8 mm in diameter), thick-walled cysts, and extra-pulmonary bone and liver lesions. Perhaps the most beneficial aspect of PET is to assess the response to therapy.[11,13] In our case, FDG-PET was useful in deciding about the site of biopsy. As only a focal area in the lung was showing metabolic activity, biopsy was directed at that particular area, and was helpful in confirming the diagnosis. The diagnosis of LCH is based on histological and immunophenotypic examination of lesional tissue. The main feature is the morphologic identification of the characteristic LCH cells. Additionally, positive staining of the lesional cells with CD1a and/or Langerin (CD207) is required for definitive diagnosis.[14]

The use of prednisone in the management of PLCH was previously recommended to be the best available treatment. However, more recently, it has been observed that corticosteroid therapy may be associated with a greater likelihood of deterioration than improvement.[15] In the absence of evidence of a benefit, experts have suggested that corticosteroid therapy should be reserved for symptomatic patients with predominantly nodular lesions on HRCT scans, since these are most likely to be beneficial at the stage of the disease in which inflammatory, rather than fibrotic lesions are present.[16] Cytotoxic drug therapy (including vinblastine, etoposide, busulphan, chlorambucil, and 6-mercaptopurine) can be considered as a treatment option for those who fail smoking cessation and glucocorticoid therapy, and especially for those who have multiple organs involvement.[17]

Factors predicting poor outcomes include onset of PLCH at an old age, prolonged constitutional symptoms, recurrent pneumothorax, extra-thoracic lesions, diffuse cysts on imaging studies and severe pulmonary function abnormalities on spirometry and the presence of pulmonary hypertension.[18] The major cause of death in PLCH is respiratory failure from progressive disease. These patients are also at an increased risk of developing malignancies.[19] Patients with progressive PLCH usually require lung or heart-lung transplantation.[20] Severe pulmonary hypertension being associated with a higher risk of death, is also an indication for lung transplantation in patients with PLCH.[21] Recurrence rates for PLCH are as high as 20% in the allograft following lung transplantation. Risk factors include presence of extra-pulmonary disease before transplantation, and resumption of smoking following lung transplantation. Despite advances, LCH remains an enigmatic disease with a highly variable presentation, and an equally variable outcome.

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