The sputum culture was negative. Post operatively she was treated with anti-tuberculous medications. The wound completely healed after 10 months.

Tuberculosis (TB) remains a major global health problem. Isolated sacral tuberculosis usually presents as chronic back pain in adults and discharging sinuses or abscess formation in children, with or without neurological deficit [2].

Definitive diagnosis of tuberculosis involves demonstration of *Mycobacterium tuberculosis* by microbiological, cytopathological or histopathological methods. Histological examination of the biopsy usually shows epithelioid granulomas, Langhans' type multinucleated giant cells and caseous necrosis, as in this patient's biopsy specimen [3]. Demonstration of acid fast bacilli by special stains is also possible. Only 35-60% of cases can be diagnosed by demonstrating acid-fast bacilli in the biopsy specimen. Culture of the biopsy material may increase the diagnostic yield [2]. Other tests include polymerase chain reaction (PCR) to detect mycobacterial DNA and enzyme-linked immunosorbent assays (ELISAs) [4].

## Conflicts of interest

We declare that there are no conflicts of interest.

## References


1. Kumar A, Varshney MK, Trikha V, Khan SA. Isolated tuberculosis of the coccyx. *J Bone Joint Surg Br* 2006; **88**: 1388-9.
2. KimDoUn, Kim SW, Ju CL. Isolated coccygeal tuberculosis. *J Korean Neurosurg Soc* 2012; **52**: 495-7.
3. Kumar V, Abbas A, Fausto N, Aster J. Robbins and Cotran Pathologic Basis of Disease: Chronic inflammation. 8th edition. China: Saunders Elsevier 2010.
4. Barker JA, Conway AM, Hill J. Supralevator fistula-in-ano in tuberculosis. *Colorectal Dis* 2011; **13**: 210-4.


# Pulmonary fibrosis with cholesterol granulomata in a patient working in a fireworks factory

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The fireworks manufacturing industry in Sri Lanka dates back nearly 80 years and is concentrated mainly in Kimbulapitiya. Aluminium powder is the key inorganic (metal) ingredient used in the manufacturing process which is liable to cause pneumoconiosis (pulmonary aluminosis) with prolonged and sustained exposure. However only few cases of pulmonary aluminosis had been reported [1, 2].

A 27-year old male presented with progressively worsening shortness of breath on exertion for four months and non productive cough for one year period. He did not have fever or haemoptysis but complained of reduced appetite and weight loss. He had no history of asthma or other comorbidities. He had a history of smoking. He has been working in the fireworks manufacturing industry for the last 10 years where he had unprotected exposure to fireworks powder dust which is composed mainly of aluminium powder, potassium nitrate, barium nitrate and sulphur. Chest examination revealed bilateral fine end inspiratory crepitaions. Chest X ray revealed diffuse bilateral alveolar and interstitial opacities with hilar congestion and mild cardiomegaly (Figure 1). Contrast enhanced CT chest showed bilateral upper lobe fibrotic changes with areas of ground glass opacification and left sided small pneumothorax with pleural thickening (Figure 2).

Pulmonary function tests showed a severe restrictive pattern with forced vital capacity (FVC) of 1.01 l (24.9% of predicted). The diffusing capacity for carbon monoxide (DLCO) was as low as 0.36 ml/min/mmHg (1.1% of the predicted). Six minute walk test (6MWT) showed a

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Figure 1. **The chest X ray shows diffuse bilateral alveolar and interstitial opacities with hilar congestion and cardiomegaly.**

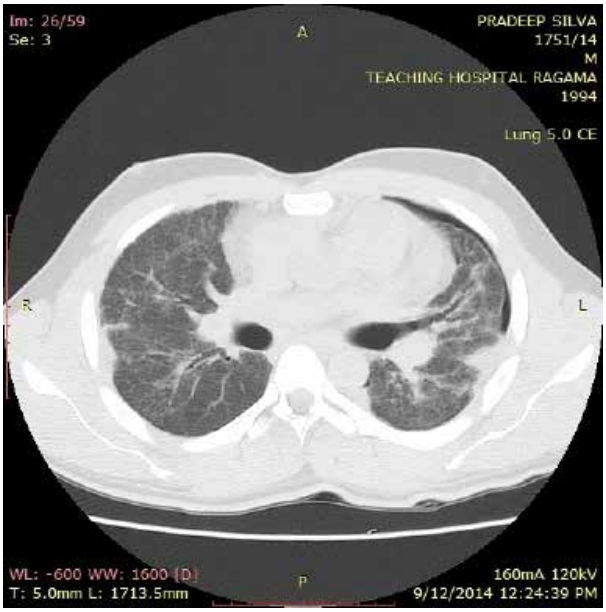


Figure 2. **CT thorax showing bilateral upper lobe fibrosis, left pneumothorax and increased left pleural thickening.**

resting oxygen saturation of 92% which dropped to 88% after walking 200 m. Lung biopsy showed sub pleural honeycombing and peribronchial interstitial fibrosis with peribronchial foreign body giant cells arranged in groups showing empty elongated spaces, compatible with interstitial and intra-alveolar cholesterol granulomata (Figure 3).

In Sri Lanka we do not have the facility of energy

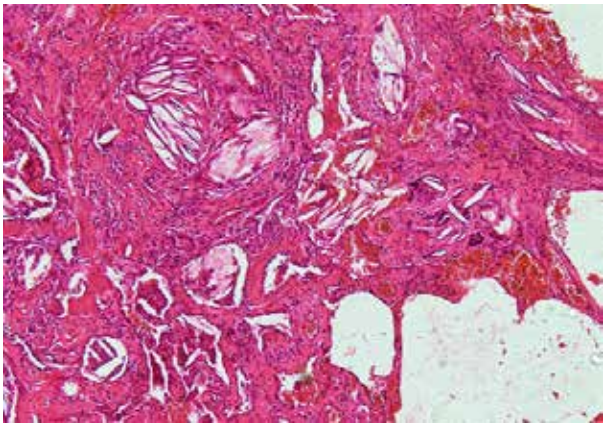

Figure 3. **The histology showing sub pleural honeycombing and peribronchial interstitial fibrosis with peribronchial foreign body giant cells.**

dispersive X ray analytical spectrometry which would identify the presence of metal particles in cholesterol granulomata. His serum aluminium level was estimated using inductively coupled plasma mass spectrometry which was 46.48 µg/l, three folds more than the upper limit of reference range (<15 µg/l).

Based on the prolonged exposure to aluminium powder, thoracic imaging suggestive of pneumoconiosis, the pathological findings of intra-alveolar and interstitial cholesterol granulomata with subpleural and peribronchial fibrosis and raised serum aluminium levels, the most likely diagnosis appears to be pulmonary fibrosis and cholesterol granulomata formation following exposure to dust containing aluminium. He was advised to stay away from the firework industry and was managed symptomatically and currently awaiting follow up assessment with imaging and pulmonary function tests.

The term ''Aluminium Lung'' was first described by Goralewski in the 1940s [3]. However the association between industrial exposure to aluminium dust and pneumoconiosis has rarely been reported in the literature. In a case report aluminium fume induced pneumoconiosis is described in two coworkers employed in an aluminium ship building facility, who had been exposed to aluminium fumes during arc welding [1]. There have been extensive discussions regarding the pathophysiological basis of aluminosis in the literature. Histological features in aluminosis are typical due to the presence of pulmonary fibrosis to various extents and in most cases confirmed by the presence of particles containing aluminium [4].

Interestingly, other than the extensive fibrosis, the characteristic pathological feature described in the

histology in our patient was the presence of numerous cholesterol granulomata in both the alveolar spaces and the interstitium. In the published literature we could locate only one study which describes this histological pattern in a background of pneumoconiosis where the authors described a case of a fibrotic lung disease that developed after a four year exposure to indium tin oxide, a chemical used in a liquid crystal display (LCD) manufacturing plant [5]. We believe that ours is the first reported case that describes a possible association of pulmonary fibrosis with cholesterol granulomata in a patient exposed to industrial aluminium powder. We hope that this would shed new light in the understanding of pathogenesis of pulmonary aluminosis. Furthermore the case also highlights the importance of looking for aluminium induced lung fibrosis among workers occupied in fireworks manufacturing industry.

## Conflicts of interest

Authors declare there are no conflicts of interest.

## References


1. Hull MJ, Abraham JL. Aluminum welding fume-induced pneumoconiosis. *Hum Pathol* 2002; **33**: 819-25.
2. Smolkova P, Nakladalova M, Tichy T, Hampalova M, Kolek V. Occupational Pulmonary Aluminosis: A Case Report. *Industrial Health* 2014; **52**: 147-51.
3. Goralewski G. The aluminum lung: a new industrial disease. *Br J Ind Med* 1948; **6**, 53-4.
4. Krewski D, Yokel RA, Nieboer E, *et al*. Human health risk assessment for aluminum, aluminum oxide and aluminum hydroxide. *J Toxicol Environ Health B Crit Rev* 2007; **10** Suppl 1, 1-269.
5. Homma S, Miyamoto A, Sakamoto S, Kishi K, Motoi N, Yoshimura K. Pulmonary fibrosis in an individual occupationally exposed to inhaled indium-tin oxide. *Eur Respir J* 2005; **25**: 200-4.