A CASE OF PRIMARY DIFFUSE TRACHEOBRONCHIAL AMYLOIDOSIS TREATED BY LASER THERAPY

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ABSTRACT

We report a case of primary diffuse tracheobronchial amyloidosis in a 72-year-old lady who presented with a long history of recurrent cough, dyspnoea, wheezing, haemoptysis and chest infection. She was treated successfully with three sessions of laser therapy. There were improvements in both clinical symptoms and measurements of airway obstruction. Bronchodilators and oral prednisolone were not required after treatment.

Keywords: Tracheobronchial Amyloidosis, laser therapy

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INTRODUCTION

Amyloidosis is characterized by the extracellular deposition of the substance amyloid, which emits a unique green birefringence when viewed under a polarizing microscope after staining with Congo Red. Amyloidosis localized to the lower respiratory tract is rare; the first case was reported by Lesser in 1877[1]. We describe the first case of primary diffuse tracheobronchial amyloidosis in Singapore and its treatment by photocoagulation therapy using a neodymium yittrium-aluminium-garnet (Nd-YAG) laser to relieve airway obstruction.

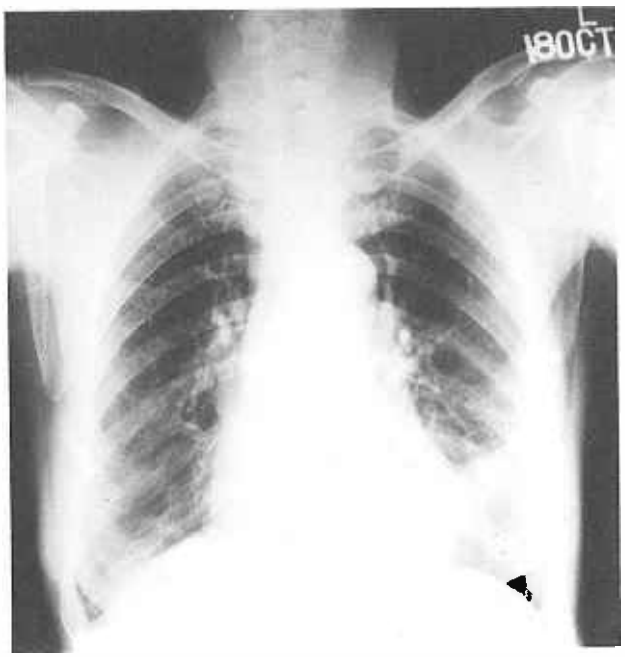
CASE REPORT

This Chinese woman first presented to our department in April 1977 at the age of 58 years. She complained of haemoptysis associated with pleuritic pain. She had a history of chronic productive cough for 20 years and had been treated by general practitioners whenever there were exacerbations. There was no history of any severe childhood respiratory illness or sinusitis. She was a non-smoker. Physical examination was normal. Chest radiograph showed some areas of atelectasis in both bases. She was diagnosed to have bronchiectasis and given a course of antibiotics.

She defaulted follow up but was again admitted in 1984 for dyspnoea at rest as well as haemoptysis. She developed type II respiratory failure with hypotension. Bilateral rhonchi were heard over both lungs. Chest radiograph was normal. She made rapid recovery with a short duration of respiratory support and eventually was well enough to be discharged with bronchodilators and oral steroids. The blood gas on discharge: arterial oxygen tension (PaO_2) of 54.4 mmHg and arterial carbon dioxide tension ($PaCO_2$) of 41.5 mmHg on atmospheric air. Her forced expiratory volume in the first second (FEV1) was 0.55 litre, forced vital capacity (FVC) 1.43 litres and FEV1/FVC 39%. There was no bronchodilator response. She continued to have wheezing episodes despite medications. She was last seen in May 1985 after which she did not turn up for further follow up.

She had recurrent attacks of dyspnoea which were often aggravated by upper respiratory tract infection. She was admitted in March 1987 for a severe episode of breathlessness associated with wheezing, productive cough and fever. She was in hypercapnic respiratory failure with acidosis. Leukocytosis was present. Her chest radiograph showed pneumonic patches in both bases and right lower lobe collapse. The airway obstruction was not relieved by bronchodilator. She was intubated and treated for status asthmaticus. She then developed a right middle lobe collapse. In view of this, a bronchoscopy was performed. The mucosa of the tracheobronchial tree was oedematous and erythematous. The orifice of the right upper lobe was obstructed by a "swollen mucosa". Aspirate grew Klebiella and Pseudomonas. Acid fast bacilli and malignant cells were not detected. Chest radiograph showed re-expansion of the collapsed lobes after the lavage during bronchoscopy. She was weaned off the respirator but after eight days, she had a similar episode of dyspnoea associated with collapse of the same lobe. A second intubation was required for respiratory support and bronchial lavage was performed again. Thick insipated mucus was reported. The

Fig 1 - Chest radiograph (1988) showing lingular opacity



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mucosa was again noted to be oedematous. She was eventually weaned off the respirator after three weeks. Her blood gas on discharge: $Pa0_2$ = 71.8 mmHg and $PaCO_2$ = 45.4 mmHg on air. The chest radiograph showed lingular opacities and right basal atelectasis. She defaulted follow up again.

In June 1988, she was referred for investigation of a lingular opacity (Fig 1). Sputum smear for acid fast bacilli was negative. An empirical course of anti-tuberculous treatment was instituted without response. The sputum culture for acid fast bacilli was also negative. In view of this, a bronchoscopy was carried out. The mucosal lining was noted to be very granulomatous (Fig 2). The orifice of the right upper lobe was partially obstructed by a huge granule. Several biopsies were taken from this granule. The orifices of the rest of the respiratory tree were obstructed by submucosal plaques as well as smaller granules. Histology showed hyperplastic bronchial mucosa with globular masses of amorphous material in the submucosal layer. The stain for amyloid was positive (Fig 3).

Fig 2 - Picture taken during bronchoscopy showing distortion of the mucosa with granules and plaques

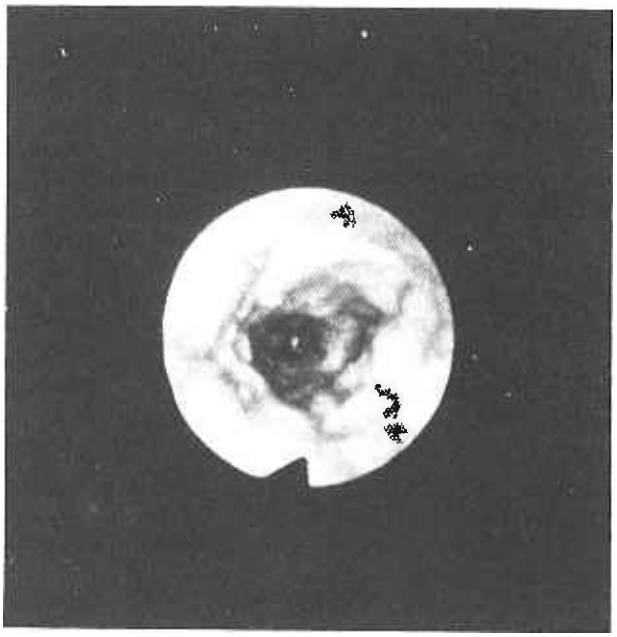
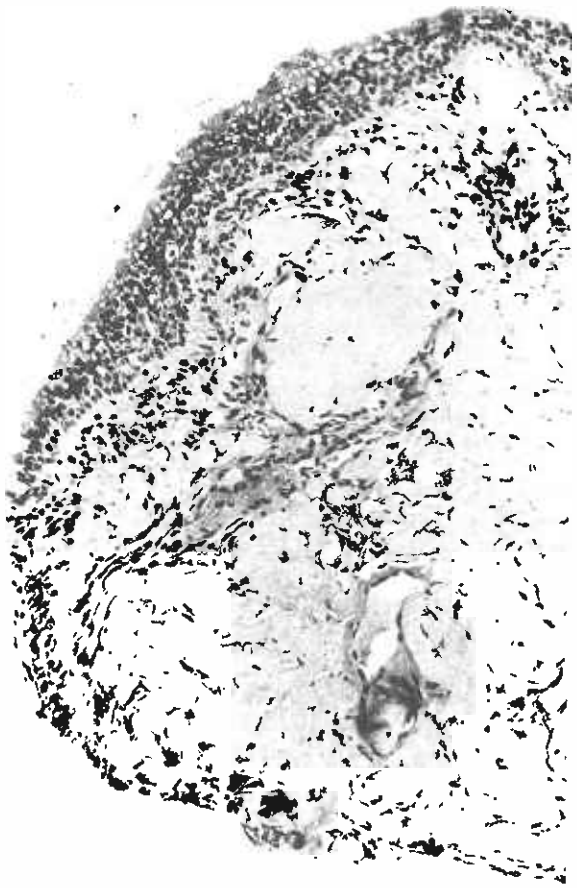


Fig 3 - Biopsy showing deposits of amyloid in the submucosal tissues (Haematoxylin and Eosin stain).



Retrospectively, our patient had no symptom of chronic extrapulmonary disease or systemic involvement by amyloid. Her urine analysis did not show the presence of Bence Jones protein and electrophoresis was normal. Both serum protein and immunoglobulin electrophoresis did not show any abnormality. The ESR was 18 mm per hour. Liver function tests were normal. Two dimensional echocardiography of the heart did not show any amyloid deposit. The CT Scan of the thorax showed modular appearance and thickening of the tracheal wall as well as the lingular bronchus which was also narrowed with associated collapse and consolidation. Bone marrow and rectal biopsies were not done.

She had two more admissions for acute exacerbation of breathlessness with chest infection before she agreed to laser therapy in September 1989. The Nd-YAG laser was used and the procedure was performed under general anaesthesia during the first and second sessions and under local anaesthesia during the third session. We used a power of 30 watts for laser burn of one second duration. The total joules used for each session was 1185, 1075 and 2787 respectively. All three sessions were not associated with any complication. Her symptoms of dyspnoea and wheezing were markedly reduced. She was eventually taken off bronchodilators and steroids and has remained relatively well. Her lung function results are shown in Table I.

Table I - Showing Lung Function Tests Before and After Laser therapy

		Before 1/8/89	After 29/3/90	Percentage Change (%)
VC	(L)	1.86 (76.5)	2.07 (85.2)	11.3
FEV1	(L)	1.07 (54.6)	1.53 (78.1)	43.0
FEV1	(%)	57	73	28.1
MMFR	(L/SEC)	0.77 (30.1)	1.23 (48.0)	59.7

Parenthesis indicate percent of predicted normal

DISCUSSION

Amyloidosis is a rare condition which may be widespread throughout the body or confined to an organ. Primary pulmonary amyloidosis presents in two main forms: tracheobronchial type with multifocal submucosal plaques and tumour-like masses or the parenchymal type as multiple or solitary nodules or diffuse alveolar septal infiltrations[2-10]. The tracheobronchial type is seen more frequently[2]. Amyloidosis is a disease discovered in later adult life and the incidence is higher in males[7,8]. The duration of symptoms is quite variable in the cases reported in the literature so far.

The clinical presentation depends on the type of pulmonary amyloidosis. The diagnosis of amyloidosis in the respiratory tract may be difficult as it can simulate bronchiectasis, tuberculosis, bronchial carcinoma, asthma and many other respiratory diseases. In our case, the patient was first diagnosed to have bronchiectasis and subsequently bronchial asthma. She was also treated empirically for tuberculosis. Finally a diagnosis of amyloidosis was made after a bronchoscopic assess-

ment. Patients with tracheobronchial submucosal plaques may complain of cough, dyspnoea, stridor or haemoptysis. Haemoptysis may become life-threatening as the disease progresses. They frequently suffer from repeated episodes of bronchial infection and may eventually develop areas of bronchiectasis. Bronchoscopy is useful and important in the diagnosis. Characteristically, the lesions are widely dispersed, irregular in size and shape and diverse in colour. They may vary from small, flat elevations to broad plaques and longitudinal folds[8]. Biopsy is required for histological confirmation[11]. Bronchography may show tracheal lesions encroaching upon the lumen and occupying most of its length. The walls of the main bronchi will appear thickened while the peripheral tree show features of chronic bronchitis[12]. The chest radiograph may be normal or show areas of atelectasis secondary to obstruction by amyloid lesions[13]. In contrast, the endobronchial tumour-like masses usually occur in the main bronchi as in our case. Hence the clinical features, radiographic changes and macroscopic appearance at bronchoscopy may be indistinguishable from that of a neoplasm. Of the two forms, patients with tracheobronchial submucosal plaques may be associated with tracheobronchopathia osteoplastica in the long run[14,15]. Patients with parenchymal nodules are usually asymptomatic and referred for investigation after an incidental finding on their chest radiograph. The nodules may be solitary or multiple, and may affect both lungs. They are usually peripheral and subpleural, ranging in size from 1 to 15 cm in diameter. There may be cavitation or calcification in up to one third of them. The group with the diffuse parenchymal lesions may present with an abnormal chest radiograph or more frequently, they complain of progressive dyspnoea. The radiographic abnormality may be confused with pulmonary oedema or with pulmonary fibrosis.

The treatment for pulmonary amyloid depends on the type. In our case, bronchoscopic laser cautery was the treatment of choice[16-18]. The amyloid is very sensitive to laser photoirradiation with a power setting of less than 30 watts. This contrasts with pulmonary neoplastic tissue which frequently requires 70 watts or greater to result in coagulation and necrosis[17]. Piecemeal necrosis does not occur following photoirradiation but a membrane of coagulated tissue is formed. It is not associated with severe bleeding as in bronchoscopic piecemeal resection because the Nd-YAG laser coagulates small vessels[17,19]. Recurrence is very rare [6,16]. However repeated sessions are required[6]. The treatment for the other forms include total resection in the nodular form as well as corticosteroid, immunosuppressants and radiotherapy but with limited success[6].

Pulmonary amyloid may be more common than is generally recognised. It can mimic various diseases and should therefore be thought of when a clinical diagnosis proves difficult to confirm on initial investigation.

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