Case Report

A Case of Unilateral Vocal Cord Palsy due to Bakelite Exposure

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Abstract

A 53-year-old male presented with complaints of dry cough, hoarseness and breathlessness for two months. He has been working in an electrical switch manufacturing unit for 25 years with history of exposure to Bakelite fumes and dust. Otorhinolaryngology examination revealed left-sided vocal cord palsy. Chest radiograph showed bronchiectasis. Other investigations like computed tomography of neck and chest, bronchoscopy with lung biopsy and magnetic resonance imaging of vagus nerve did not reveal any pathology for the cause of vocal cord palsy. We considered occupational exposure to Bakelite as the cause of vocal cord palsy and the patient was counselled to refrain from the occupational exposure to Bakelite. Subsequently, on regular follow-up, no further deterioration of the symptoms was observed. **[Indian J Chest Dis Allied Sci 2021;63:33-36]**

Key words: Vocal cord palsy, Bakelite Occupational exposure

Introduction

Industrialisation has created many jobs and gave impetus to the economic growth of the country. However, in the absence of stringent regulations, there is an increase of occupational health hazards for the industrial workers. Bakelite is known as world's first synthetic thermosetting polymer manufactured with condensation of phenol and formaldehyde and cannot be re-melted.[1, 2] Its toxic nature is a well known phenomenon.[3] It is used for production of bracelets, jewellery, electrical switches etc. Manifestation of Bakelite exposure can range from bronchiectasis, hypersensitivity pneumonitis to granulomatous disease of the lung leading to pulmonary fibrosis.[4,5] Its toxic fumes act as an irritant and the relationship between exposure and vocal cord dysfunction has been observed.[6-10]

Case Report

A 53-year-old male, non-addict with no co-morbidities, presented with complaints of dry cough with hoarseness and dyspnoea for the last two months. There was no history of trauma or surgery in the past. On examination, his oxygen saturation was 93% at room air, respiratory rate was 18 breaths per minute, pulse rate 84 beats per minute and blood pressure was 130/80 mmHg. General physical examination was normal. Respiratory system examination demonstrated bilateral infra-scapular rhonchi and few inspiratory crepitations. Upper airway examination by Otorhinolaryngologist revealed left-sided vocal cord palsy on indirect laryngoscopy.

Chest radiograph (postero-anterior view) showed bilateral reticular opacities. Routine blood investigations did not show any abnormality. Other investigations like antinuclear antibody, anti-double stranded DNA antibody, rheumatoid factor, hepatitis B surface antigen, antibodies to hepatitis C and antibody to human immunodeficiency virus were negative. Direct sputum smear examination for acid-fast bacilli (AFB) was negative twice and culture for *Mycobacterium tuberculosis* was also negative.

In view of a high suspicion of malignancy, contrast enhanced computed tomography (CECT) of the thorax and neck were done. The CT of the neck region was unremarkable, while CT of the thorax showed bilateral bronchiectasis, centrilobular nodules and bronchiolitis (Figure 1). Spirometry showed mixed pattern abnormality with forced vital capacity (FVC) of 1.21 L (36%), forced expiratory volume in one second (FEV_1) of 0.68 L (24%) and FEV_1/FVC ratio of 56%. Two-dimensional echocardiography was normal. On fibreoptic bronchoscopy, left-sided vocal cord palsy was observed (Figure 2). In the tracheobronchial tree, all

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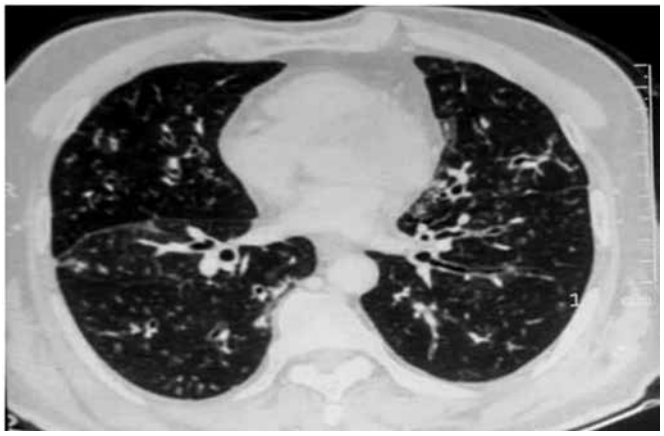

Figure 1. Contrast-enhanced computed tomography of the chest (lung window) showing bronchiectasis with bilateral parenchymal nodules.

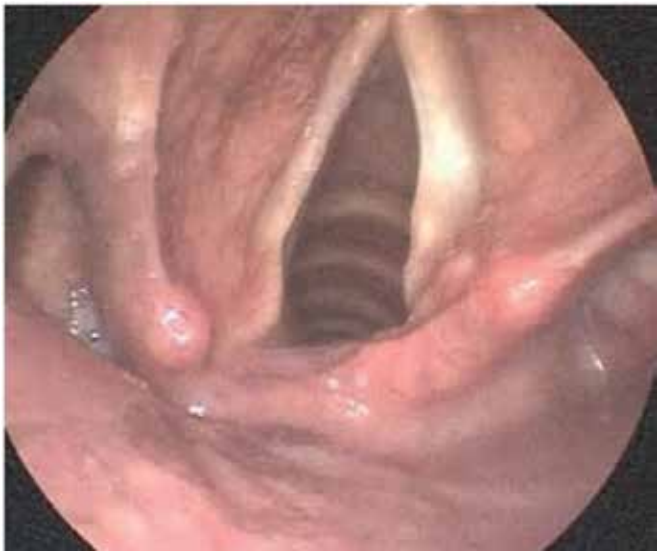

Figure 2. Fiberoptic bronchoscopy showing abductor palsy of left-sided vocal cord.

bronchial openings on both the sides were normal with no endobronchial pathology. Bronchial washing taken from the right middle lobe for cytological examination showed inflammatory and degenerated cells. Bronchial washings for AFB staining and culture for *M. tuberculosis* were negative. Transbronchial lung biopsy (TBLB) from the right middle lobe revealed thickened alveolar septa with mild lymphocytic infiltration, haemorrhage and focal carbon pigmentation. Magnetic resonance imaging (MRI) of the vagus nerve course was also normal (as the vagus nerve and its branches may contribute to the aetiology of vocal cord palsy). The MRI of recurrent laryngeal nerve did not show any entrapment phenomenon.

After excluding all the known aetiologies of vocal cord palsy, occupational exposure of Bakelite was considered as the cause in this patient, on the basis of the temporal relationship of the symptomatology and the continuous occupational exposure history. The patient was advised to refrain from the Bakelite exposure and to change his occupation. The patient did not report any further deterioration of the symptoms after a regular follow-up of two years.

Discussion

Vocal cord palsy is not an uncommon entity seen in clinical practice. In most of the patients, the culprit is an underlying malignancy. However, irritants at work-place can also be the cause of this entity.[8,10] In our patient, Bakelite was detected to be the aetiological occupational exposure. Bakelite is one of the commonly used form of plastic worldwide. It is a phenol formaldehyde polymer and while handling it in manufacturing processes, it is advised to use respirators to avoid probable detrimental health effects. Its toxic dust is well known to cause occupational lung disease and significant morbidity.[4,5] It is an established fact that particle size of <5 micron can pass till small airways, thereby exposing anatomical structures of the respiratory tract to this polymer, and thus, initiating a cascade of immunological reactions as occurring in hypersensitivity pneumonitis.[5,11]

In patients with unilateral vocal cord palsy, symptoms like hoarseness of voice predominate than typical symptoms of breathlessness, seen mostly in bilateral vocal cord palsy. The causes of vocal cord palsy are malignancy, infections, post-surgery, and trauma. Although a substantial number of cases are idiopathic, a high index of suspicion is required to elicit occupational and environment history in detail before labelling the cause to be idiopathic.[6-8] Occupational history is the key to diagnose these irritant-induced cases as early intervention in the form of avoidance of the irritant could prevent further deterioration in the symptoms and quality-of-life.

Almost 20% of unilateral vocal cord palsy are idiopathic and can be caused by any process that interferes with the function of the recurrent laryngeal nerves. The key mechanisms of nerve involvement, beside surgical trauma include compression of nerve, vagus neuropathy and irritation of nerve. Because of its longer course, left recurrent laryngeal nerve is more susceptible and the commonest site of nerve compression is at the level of the arch of the aorta.[7,8,12]

However, there is lack of data on occupational exposure and vocal cord palsy. Lisboa *et al*[13] concluded that patients exposed to chemicals experienced voice and speech problems. Brooks[14] listed various inhalational exposure causes of vocal cord dysfunction including

welding fumes, adhesive vapours, glutaraldehyde, ammonia and latex antigen amongst other causes. In our patient, Bakelite not only caused pulmonary manifestations as seen on CT of the thorax, but also manifested as vocal cord palsy.

It is imperative to periodically screen patients exposed to occupational dust and fumes, since no specific treatment is available and only supportive care is indicated in advanced disease. The various manifestations of Bakelite exposure are rhinitis, dermatitis, micro-nodular changes on chest radiography and interstitial lung disease. The commonest lung manifestation is pneumoconiosis. The pulmonary manifestation may start as chronic bronchitis, further progress as bronchiectasis and subsequently may lead to pulmonary fibrosis.[5,15-17] Upper airway irritation and chest tightness have been described as common respiratory symptoms associated with this exposure. Respiratory impairment with reductions in FEV_1 and FVC has been also demonstrated in studies, mainly ascribed to formaldehyde.[18,19] Environmental pollutants and occupational irritants causing vocal cord dysfunction is a well established fact.[6] Bakelite is known for toxic effects secondary to inhalation of dust.[5] The formaldehyde and phenol content of Bakelite are considered as potential occupational irritants and most of the toxicities are attributed to the either or both.

There is no literature on the correlation between Bakelite exposure and vocal cord palsy. However, asbestos dust inhalation leading to vocal cord dysfunction has been described in the past.[5,20-22] Occupational diseases usually manifest after a prolonged period of exposure. It is well known that pleural mesothelioma after asbestos exposure has a long latency period.[23] Gothi *et al*[24] reported non-malignant asbestos-induced lung diseases in 11 workers with exposure ranging from 18 to 30 years. Lisboa *et al*[13] reported three cases of occupational-related hoarseness with symptoms occurring after 12-14 years. In the case presented here, the time lag between first occupational exposure to Bakelite and onset of symptoms was 25 years.

In conclusion, occupational lung disease and other systemic manifestations following Bakelite exposure is one of the under-recognised causes of morbidity among industrial workers. Eliciting a detailed history of occupational exposure could provide the first clue for the possible cause in a patient. Due to the absence of stringent regulatory mechanisms in resource-limited countries, like India, industrial workers who are exposed to toxic dust and fumes are not well equipped to minimise detrimental exposures of these toxins and hence more prone to the occupational hazards. Due to a low index of suspicion, their symptoms are correlated with all other known causes; and many a times occupational and environmental history is ignored, while lung damage attributed to the occupational exposure continues relentlessly. There should be stringent regulations to periodically screen workers in occupational hazard prone industries to reduce morbidity and mortality in the unsuspecting workers.

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