
CASE REPORT

Occupational Asthma among checker: A Case Report

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ABSTRACT

Occupational asthma is a common work-related respiratory disorder. Specific agent inhaled initiates immune reaction resulting in occupational asthma. Forced Expiratory Volume in the First Second were 68% compared with predicted and the Forced Vital capacity were 59% resulting ratio of 115% compared to reference value. The Forced Expiratory Flow of 25-75% was 75% and the Peak Expiratory Flow was only 48% of the reference value. The Peak Expiratory Flow was generally lower when the employee was working as she was exposed to ultra-violet coatings and ethylene vinyl acetate copolymer. She was also incessantly exposed to particulate matter at the workplace creating Asthma-COPD overlap syndrome and associated with low Forced Expiratory Volume in the First Second. The individual may exhibit asymptomatic upon removal of causative agent though the persistence of symptoms may exist even after removal of the patient especially among those exposed for a long period to the causative agents.

Keywords: Bronchial asthma, Peak Expiratory Flow Rate, UV coating

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INTRODUCTION

Occupational asthma is caused by exposure to specific agent inhaled at workplace triggering immune reaction. The attributed risk of occupation asthma was about 10 to 25%. There are about 400 agents identified to cause occupational asthma (latent form); high molecular mass agents triggering specific IgE and low molecular mass agents [1]. The common high molecular mass agents are wheat flour and α -amylase in baker and natural rubber latex among latex-glove makers. The common low molecular mass agents are di-isocyanates seen among paint sprayers and also glutaraldehyde and chlorhexidine among health care workers. The mechanism of sensitization in the low molecular weight agents is poorly understood, though there are chemicals that are associated with IgE production [2]. The greater the exposure to the agent, the higher the incidence of asthma. The exposure to low concentration of chemicals may induce asthma such as among textile workers, nurses and cleaners. The examples of irritant exposure asthma are fire smoke, toluene diisocyanate among painters, paints among spray-painters, and diesel exhaust found among railroad workers.

CASE REPORT

A 53 years old lady was referred for compensation due to exposure to chemicals in the workplace. The patient was diagnosed to have bronchial asthma since 2003. She has been having shortness of breath (asthma attacks) twice a week necessitating rescue inhaler and nebulizer. Her attacks were triggered at work but improved during off-days. She also gives history of having allergic rhinitis, eczema and hypertension. She was intubated twice for severe asthma.

The patient has been working as a checker in a printing company since 1988 where she would check the printed materials to ensure no defects were present. She has been doing the work for 4 years. Prior to the task, she would check materials that have been glued over the boxes. She would occasionally wear 3-ply surgical mask. The company has been dealing with printing papers and boxes using ultra-violet (UV) coatings.

A walk-through survey was conducted in the company. The patient was directly exposed to UV coating materials. Three weeks of Peak Expiratory Flow Rate (PEFR) were performed where four readings were taken in a day [3]. The first and fourth reading were away from work while the second and third were done during work. As shown in Figure 1, PEFR readings were generally higher during first week when she was on annual leave except on Monday when she was working. The readings were higher on Sundays and when she was off-duty. Her Chest X-ray was normal. The spirometry showed 59% compared with predicted normal Forced Vital capacity (FVC) and 68% compared with normal Forced Expiratory Volume in the First Second (FEV₁). The FEV₁/FVC was 115% compared to reference value and Forced Expiratory Flow 25-75% was 75%. The Peak Expiratory Flow (PEF) was only 48% of the reference value. The lung volumes and diffusion capacity of carbon monoxide (DLCO) were not done.

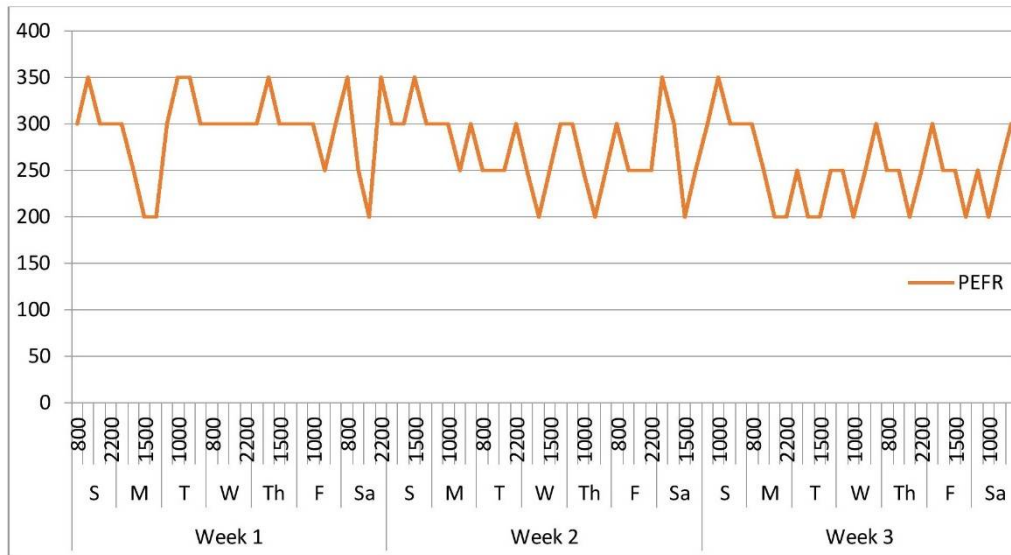


Figure 1: PEFR according to week distribution

The patient was found to be unfit for her current job since she has been having frequent attacks and would continue for disability assessment for Whole Person Impairment since she has achieved Maximal Medical Improvement [4].

DISCUSSION

In Bronchial Asthma, obstructive pattern of ventilation is observed when FEV₁ and FEV₁/FVC would decrease while the Total Lung capacity (TLC) may be normal or increased while FVC may be normal or decreased [5]. The asthma is confirmed when there is improvement of FEV₁ of more than 12% after administration of bronchodilator or 20% drop in FEV₁ after provocation concentration of methacholine or histamine of more than 8 mg/mL. In restrictive pattern of ventilation, FVC is decreased, FEV₁ is decreased or normal, FEV₁/FVC is normal and TLC is decreased. In this patient, the findings could be restrictive or obstructive pattern as there were no TLC nor DLCO were done or she might have not inhaled or exhaled completely or she could not exhale long enough to empty the lungs or else she might have patchy collapse of small airways early in exhalation. This patient is classified as moderate severity based on spirometry findings [6]. In obstructive pattern, after bronchodilation changes of FEV₁ should be more than 12% or 200ml. Unfortunately for this patient, bronchodilator was not given for fear of angioedema.

The ultra-violet coatings consisted of acrylated products, isocyanates and resins which are respiratory sensitizers. The Durabond PC 8898 consisted of ethylene vinyl acetate copolymer which may cause respiratory irritation [7]. The patient may be exposed to the low concentration of chemicals for years inducing irritant-induced asthma. She may also be continuously exposed to particulate matter (PM_{2.5} and PM₁₀) as the place is dusty, generating Asthma-COPD overlap syndrome (ACOS) and associated with low FEV₁. The exposure may be reduced by using appropriate respirators such as carbon respirator 3M 9042 or 8247 as shown in Figure 2. She would have some degree of permanent impairment even after removal from the exposure. She may experience severe asthma if she continues to be exposed to the chemicals following onset of symptoms.



Figure 2: Carbon respirator 8247

Patient would improve on symptoms or render asymptomatic upon identification and removal of trigger agent and shows no evidence of residual non-specific bronchial hyper-responsiveness [1]. In contrast, patient may not respond to usual asthma treatment and symptoms continue on delayed diagnosis. Serial peak flows are measured at least for three weeks on days at and away from work, at least four times a day to assess in occupational asthma. The symptoms of occupational asthma usually improve during weekends and holidays which is observed at onset of illness. On continued exposure, the symptoms may be worse at night, not during daytime at work (late phase reaction), or react to occupational and non-occupational irritant or may not show off-work reversibility. The cornerstone of management (primary prevention) is to refrain exposure to the specific causative agent. Another option is to substitute the sensitizing agent to a safer alternative. The less volatile preparations or latex gloves with low protein or low powder content may be used by modifying the physical or chemical form. The exposure may be reduced by using robotics, containment or respirators. The workers need to be educated regarding the safe working practices and constant monitoring of exposure level of the sensitizers at the workplace [2]. In secondary prevention, medical surveillance programs are introduced for workers at risk including respiratory questionnaires with spirometry and immunologic tests. The occupational health care workers must have adequate knowledge in detecting and managing occupational asthma patients. In tertiary prevention, workers evaluated and removed from the workplace if occupational asthma is diagnosed. In irritant-induced asthma, occupational hygiene measures are emphasized include containment, good ventilation, safety practices and wearing of appropriate respiratory protective devices. The symptoms of asthma and hyper-responsiveness of airway may persist in 70% of patients with occupational asthma even after removal of the patients from the workplace after several years.

ACOS is persistent but reversible airflow limitation is reversible. ACOS tends to be more among females of younger age group of higher body mass index, lower socioeconomic status, lower education levels, and associated with conditions such as gastro-esophageal reflux disease, depression, anxiety, osteoarthritis and osteoporosis. The ACOS patients have more exacerbation rates compared to asthma or COPD patients and greater decrement in FEV₁. The environmental exposure plays an important role in generating ACOS. Patients with severe asthma for more than five years have reduced lung elastic recoil resembling COPD. Patients with COPD may develop features of asthma if they are sensitized by allergen, airway hyper-responsiveness and airway inflammation with eosinophilia and Th2 [8].

CONCLUSION

The diagnosis for this patient was occupational asthma due to exposure to ultra-violet coatings and ethylene vinyl acetate copolymer. The employee should be transferred to a different department to avoid Acute Severe Asthma which is a life-threatening medical emergency. The management ought to fix exhaust ventilations in the enclosed place to prevent continuous exposure to particulate matter.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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