

CASE REPORT

A BREATH CLOSE TO DEATH: A CASE REPORT OF IDIOSYNCRATIC REACTION TO WELDING FUMES

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A 39-year-old gentleman presented to emergency department with a few hours' history of acute shortness of breath, cough and haemoptysis that developed whilst welding a steel tank in a closed container. He was welder by profession for thirteen years with no significant past medical history. The arterial blood gas showed severe oxygenation impairment and he was intubated for mechanical ventilation. The radiographs showed bilateral widespread interstitial shadowing. The echocardiography showed normal heart and ruled out cardiogenic pulmonary oedema. The microbiological investigations were all normal. He was treated as Acute Respiratory Distress Syndrome (ARDS) secondary to exposure to welding metal fumes in a closed container. He was given limited tidal volume invasive ventilation, extubated successfully after twelve days, transferred to respiratory ward for rehabilitation and discharged few days later. Exposure to welding metal fumes at work place is a major occupational health hazard worldwide. It can cause ARDS and other respiratory illnesses such as bronchitis, metal fumes fever and chronic pneumonitis. The pathogenesis of ARDS due to welding metal fumes involves direct inhalational injury and/or immune system dysfunction. Welding metal fumes related ARDS remains the diagnosis of exclusion and all other causes must be ruled out. The key to treatment is ventilation support with early endotracheal intubation. Appropriate precautionary measures are advised to avoid occupational health hazards in welding profession.

Keywords: Emergency; ARDS; Haemoptysis; Welding; Bronchitis

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INTRODUCTION

Acute respiratory distress syndrome (ARDS) likely to be caused by welding fumes is an unusual clinical presentation. This report discusses a case of a welder who rapidly became progressively short of breath after a routine job. He presented to the emergency department (ED) in severe respiratory distress that required urgent tracheal intubation for mechanical ventilation. His clinical condition was characteristic of ARDS. He remained ventilated for 12 days in the intensive care unit (ICU), and was subsequently discharged to a respiratory ward for a period of rehabilitation before going home.

CASE REPORT

A 39 Years obese gentleman with the background of depression presented to ED with a sudden onset shortness of breath, cough and haemoptysis that started few hours earlier whilst welding a steel tank. He was a current smoker with history of six pack years. He had no other significant past medical or surgical history. He had no history of illicit drug use. He had been working as welder for 13 years.

On examination, the patient had SpO₂ 86% on 100% Fio₂, heart rate 110/min, blood pressure 135/60 mm of Hg, respiratory rate 40 bpm and clear chest on auscultation. His arterial blood gas on 100%

FiO₂ showed PH 7.14, PaO₂ 6.8 kPa, PCO₂ 9.9 kPa, HCO₃ 19.9 mmol/L and Lactate 1.3 mmol/L. Given increased work of breathing, hypoxaemia and hypercapnia, he underwent endotracheal intubation for mechanical ventilation in intensive care. The initial chest radiograph didn't show any significant abnormality that raised suspicion of pulmonary embolism [Figure-1]. CT pulmonary angiogram ruled out pulmonary embolism and showed bilateral widespread air space shadowing [Figure-3]. His repeat chest radiograph showed four-quadrant interstitial shadowing [Figure-2]. Bedside Echocardiography was normal.

He was started on intravenous co-amoxiclav, clarithromycin, oseltamivir, hydrocortisone and furosemide. All his blood cultures, atypical pneumonia screening and viral screening were negative. During the period of limited tidal volume invasive ventilation his oxygen requirement remained high, which made weaning quite difficult. After 12 days of invasive ventilation tracheal extubation was successful. In this case, Acute Respiratory Distress Syndrome due to exposure to welding metal fumes was accepted as diagnosis of exclusion.

He was transferred to the respiratory ward on day 17 of his intensive care unit admission and subsequently discharged to home on day 20 of his admission after a short period of rehabilitation.

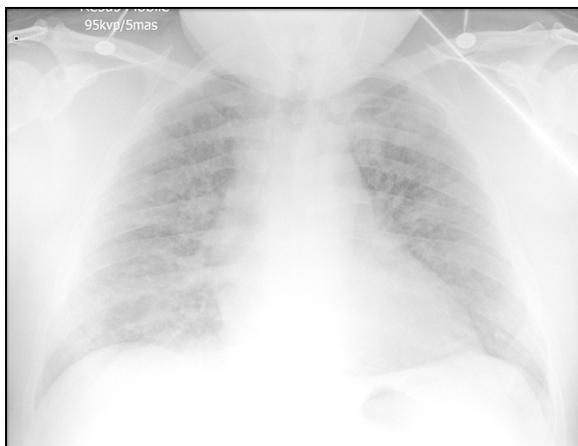


Figure-1: Chest X-ray taken on admission of the patient which does not show any sign of ARDS

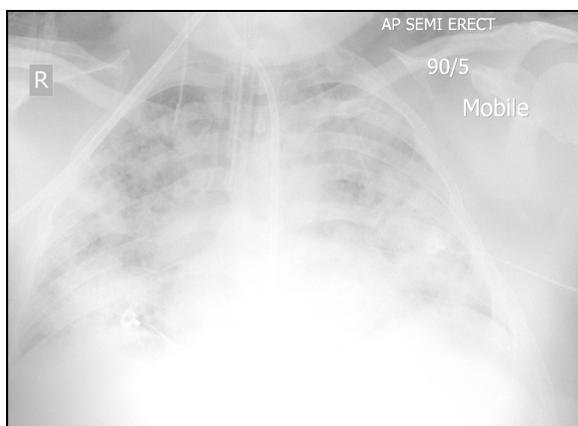


Figure-2: Repeated chest X-ray taken a few hours later in ICU after tracheal intubation. The x-ray image shows widespread interstitial shadowing which is consistent with ARDS.

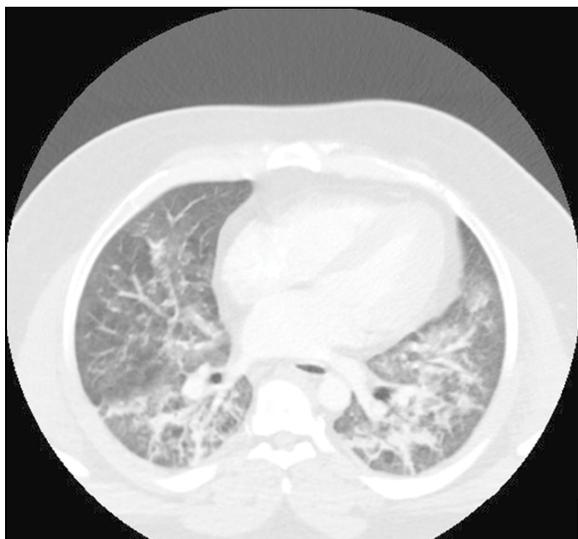


Figure-3: CT chest image highlighting diffuse interstitial infiltration also consistent with ARDS

DISCUSSION

ARDS can result from inhalation injury due to direct exposure to welding metal fumes. Epidemiological studies have reported higher incidences of respiratory illnesses such as bronchitis, metal fumes fever and chronic pneumonitis among welders exposed to higher concentration of metal-enriched welding fumes.¹

Chromium and Manganese, found in welding fumes, at certain concentrations was shown to be cytotoxic to human epithelial cells in vitro. This exposure was associated with increased intracellular phosphoprotein, interleukin 6 (IL 6) and IL 8 that subsequently recruited cells of immune system causing toxic damage to lung epithelial cells.²

Exposure to metal fumes can also cause immune system dysfunction that leads to increased risk of severe chest infections.³ Exposure to welding metal fumes is a major health hazard worldwide. It is rare for the welding fumes causing sudden shortness of breath and then leading to acute respiratory distress syndrome within few hours of exposure.

Pharmacological options for the treatment of ARDS are limited. The use of corticosteroids is controversial. Randomized controlled trials and cohort studies tend to support early use of corticosteroids for decreasing the number of days on a ventilator; however, no consistent mortality benefit has been shown with this therapy.^{4,5}

The care of patients with ARDS does not end after the acute illness and they often require prolonged hospitalisation. After discharge from the ITU, patients with ARDS tend to have a lower quality of life than they did before, significant weakness from neuropathy and myopathy.^{6,7} In one outcome study mortality at three years in those who required mechanical ventilation for any cause in ICU was 57.3% compared with those who did not require ventilation in ICU (38.3%) and those who were not admitted to ICU (14.9%).⁸

In summary, this case report highlights that the fumes given off by welding and hot cutting processes, such as nitrous oxide, carbon monoxide, ozone and the shielding gas (argon, helium) can cause ARDS and given high mortality associated with it, early endotracheal intubation and mechanical ventilation should be considered. It also emphasizes on need to take robust measures to tackle the occupational health hazards in welding profession.

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