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Severe Inhalational Toxicity from Chlorine Dioxide

Adam Bosak, Manoj Mathew
Banner University Medical Center Phoenix, Phoenix, Arizona, USA

Background: Chlorine dioxide ($Cl0_2$) is a strong oxidizing agent used as a disinfectant in water treatment plants. Chlorine dioxide is a known mucosal irritant at 0.3 ppm.

Methods: This is a case report of prolonged $Cl0_2$ exposure resulting in injury to the lungs, eyes, and peripheral nerves.

Results: A healthy 35-year-old male on was exposed to gaseous $Cl0_2$ at an unknown concentration while exchanging a pump when it became disconnected. He had immediate burning of his eyes, nose, throat and lungs. He was exposed for 45 minutes inside and enclosed room without ventilation or any personal protective equipment. He went to the hospital with dyspnea, cough, and pleuritic chest pain and received nebulizers, steroids and antibiotics. Chest CT revealed ground glass opacities bilaterally. He presented to clinic with worsening air hunger, dizziness, headaches and dyspnea now at rest. Pertinent physical finding revealed a resting tremor in all extremities and decreased inspiration. Pulmonary function test (PFTs) revealed a restrictive pattern (**table**). Six minute walk was 138 meters on room air at 96%. Bronchoscopy without biopsy on was unremarkable. He was re-admitted for worsening dyspnea and was now on 2L 0_2 at baseline and having intermittent blood tinged sputum. High resolution chest CT (HRCT) showed bibasilar septal thickening without fibrosis or evidence of air trapping. PFTs again showed a decrease in FEV1 of 20%. Bronchodilators, inhaled and oral steroids, and azithromycin have been of no clinical or symptom benefit. Gabapentin and valproic acid slightly improved his tremor. He is now legally blind and planning for corneal transplantation. A right heart catheterization revealed no evidence of pulmonary hypertension. He currently has severe limitations in daily living with symptoms at rest and is currently undergoing bilateral pulmonary transplantation evaluation.

Discussion: Severe inhalational injury from $Cl0_2$ can affect multiple organ systems and may be resistant to treatment as in this case. Constrictive bronchiolitis obliterans is suspected with continued worsening in his PFTs, hypoxia, and functional class since exposure despite a normal HRCT without biopsy.

Conclusion: Patients with toxic exposure to $Cl0_2$ may continue to decline months after exposure despite treatment and may require lung transplantation.