Experience with Hydrocarbon Poisoning in an Intensive Care Unit

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ABSTRACT

The clinical course of two adult black patients admitted to the Hillbrow Hospital Intensive Care Unit following aspiration of hydrocarbon distillates is described. This report emphasises the high morbidity and mortality associated with this form of poisoning, and highlights the need to ascertain all constituents of any poison taken by a person.

Introduction

Acute poisoning, whether accidental (occurring more commonly in children) or deliberate attempts at suicide especially in adolescents and adults, is an important cause of morbidity and mortality. The Hillbrow Hospital is an urban general hospital admitting black patients from the Johannesburg area. Only nine patients were managed in the intensive care unit (ICU) of the hospital between January 1982 and April 1987 following acute poisoning. Of these, three were following accidental intoxication, 4 resulted from suicide attempts, 1 patient was exposed accidentally to an organophosphate compound, and 1 patient was admitted for accidental poisoning with mushrooms. We wish to describe the clinical course of two adult black patients recently admitted to the ICU, to highlight the significant morbidity and mortality associated with the pulmonary aspiration of hydrocarbon distillates.

Case 1

A previously healthy 23 year old black female was admitted to ICU following the deliberate ingestion of paraffin (kerosene). She had vomited and aspirated in the casualty department. On examination, she was agitated, tachypnoeic and hypotensive. Blood gas analysis revealed a severe metabolic acidosis and marked hypoxaemia (PaO₂/FIO₂ = 50). The patient was intubated with a cuffed endotracheal tube and mechanically ventilated with a Bennet MA IB volume-cycled ventilator adapted for intermittent mandatory ventilation. A Swan-Ganz catheter was inserted to assist the management of the haemodynamic status. Inotropes (Dopamine and Isoprenaline) were commenced. Her initial chest X-ray showed bilateral basal alveolar consolidation (Fig. 1). This progressed rapidly to a diffuse pulmonary infiltrate with cavitation. Bilateral spontaneous pneumothoraces occurred necessitating the insertion of underwater intercostal drains, and were associated with large bronchopleural fistulae. Despite treatment she became progressively hypoxaemic, unresponsive to increasing levels of positive end expiratory pressure (PEEP) (maximum PEEP used was 20 cmH₂O) and inspired oxygen concentrations. She died on the 5th day after hospital admission.

Figure 1. Chest radiograph of patient number 1 showing bilateral basal alveolar consolidation.
Case 2

A 21 year old black male was admitted to the ICU following the deliberate ingestion of the organophosphate Malarsal (the constituents include mercaptothione, xylene and kerosene). He vomited and aspirated in casualty following gastric lavage. He was thereafter intubated with a cuffed endotracheal tube and atropine and Toxogonin (obidoxime chloride 250 mg) were administered to reverse the effects of the organophosphate. On initial examination he had pinpoint pupils, was sweating and salivating excessively, and had a bradycardia and tachypnoea. Blood gas analysis revealed a marked hypoxaemia (paO₂/FIO₂ = 62.5) and a metabolic acidosis. Despite low initial levels of cholinesterase (530 U/L [normal 3000-9300 U/L]), he never manifested any further signs of organophosphate toxicity, and had no muscle weakness. He required mechanical ventilation for two weeks on a Bennet MA 1 B volume-cycled ventilator adapted for intermittent mandatory ventilation for the pulmonary complications of the hydrocarbon aspiration. Ventilatory support was discontinued on day 14, and he was extubated on day 15. At present he remains well with persistent hypoxia and residual bilateral radiological opacities.

Discussion

In contrast to the significant number of patients with poisoning admitted to the medical ICU of Johannesburg Hospital, only nine patients were managed in the Hillbrow Hospital ICU for acute poisoning during a 63 month period. Two cases were admitted for management of complications following the pulmonary aspiration of kerosene. One patient, although admitted initially as an organophosphate poisoning, developed signs predominantly as a result of the aspiration of the hydrocarbon solvent (kerosene).

Hydrocarbon poisoning is common in children but relatively uncommon in adults. Following ingestion of the hydrocarbon, vomiting often follows, which is commonly associated with aspiration. The toxic effects of the hydrocarbon preparation are manifested as a result of capillary damage, with increased capillary permeability and fluid exudation. Significant alveolar oedema and haemorrhage occur as early as one hour after intratracheal kerosene instillation and peaks within 24 hours. Hydrocarbon also greatly reduces the ability of surfactant to minimise alveolar surface tensions, which could lead to atelectasis. Laboratory and animal experiments suggest that in the majority of cases direct toxicity following pulmonary aspiration is the most likely mechanism of injury rather than systemic absorption, and that the effect are mediated via inhibition of mitochondrial respiration. For this reason, gastric lavage is contraindicated in hydrocarbon poisoning unless the airway is protected by a cuffed endotracheal tube. In addition, gastric lavage in patients in whom all the constituents of any poison ingested are not known, may inadvertently lead to complications as in Case 2.

Acute manifestations of hydrocarbon poisoning include vomiting, vertigo, coughing, incoordination and bronchopneumonia. The diagnosis is often made on history and by the smell of the substance on the patient. Bilateral basal alveolar consolidation is the early radiological finding in these patients (Fig 1). This may progress to the development of pneumatoceles. Treatment is largely supportive, with enriched inspired oxygen concentrations, but may include the need for mechanical ventilation and increasing levels of PEEP and inotropes. Once inhaled, the substance will remain in the lung for years and cause low grade but progressive interstitial and intra-alveolar damage.

This report documents the low incidence of acute poisoning among an urban adult black population. It emphasises the high morbidity and mortality seen in hydrocarbon poisoning and the potential hazards of gastric lavage. We wish to stress the need for identifying individual components of any poison ingested.

 Opsomming

Die kliniese verloop van twee swart volwassenes wat opgeneem is in die Hillbrow se Intensiewe Sorgeenheid, na die inaseming van koolwaterstof derivate, word bespreek. Hierdie verslag aksentueer die hoe morbiditeit en mortaliteit wat geassosieer is met hierdie vorm van vergiftiging. Die belangrikheid van kennis aangaande die volledige hazards of gastric lavage. We wish to stress the need for identifying individual components of any poison ingested.

References