Clinical Case Report

Methyl ethyl ketone peroxide ingestion: A rare cause of corrosive chemical poisoning

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ABSTRACT

Methyl ethyl ketone peroxide, commonly used in the lamination industry, is a highly inflammable substance. Ingestion of methyl ethyl ketone peroxide is associated with a high morbidity and mortality. It can cause injury to the gastrointestinal tract on ingestion, leading to gangrene or perforation. Gastric lavage is contraindicated as it is a highly corrosive substance. We report a patient with poisoning due to methyl ethyl ketone peroxide who presented with upper gastrointestinal bleeding, and developed gangrene of the bowel and died of septicaemia and multiorgan failure.

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INTRODUCTION

Methyl ethyl ketone peroxide (MEKP) is an unstable organic peroxide used in the manufacture of acrylic resins, as a hardening agent for fibreglass-reinforced plastics, and as a curing agent for unsaturated polyester resins.[1,2] Ingestion of MEKP is rare, associated with high mortality and morbidity but there is scanty literature on its effects. We report the clinical course of poisoning after ingestion of MEKP in a young woman.

THE CASE

A 32-year-old woman, who owned a lamination shop, presented to the emergency services with a history of ingestion of a chemical used in the lamination process, with suicidal intent. She was taken to a local hospital following haematemesis, where a nasogastric tube was inserted and a stomach wash given. As she developed hypotension, 3 units of packed red cells were transfused and she was referred to our hospital for further management. At admission, she was conscious, coherent, had a pulse rate of 100/minute, respiratory rate of 28/minute and blood pressure of 100/70 mmHg. On examination, chemical burns were noted in and around the oral cavity. Examination of the chest, abdomen and cardiovascular system were non-contributory. Laboratory investigations revealed a normal haemoglobin level (12.2 g/dl), markedly elevated alanine aminotransferase (2549 i.u., ALT) and aspartate aminotransferase (1395 i.u., AST) levels, and acidosis (pH 7.29) and hypoxia (63.6 mmHg) on arterial blood gas analysis. The blood urea and serum creatinine were 158 mg/dl and 4.4 mg/dl, respectively. The chest X-ray was normal.

Oral feeding was withheld and she was started on intravenous fluids and a proton pump inhibitor. Though the liver enzymes showed improvement (day 6 AST/ALT 155/75), the renal failure worsened (day 6 creatinine 7.4 mg/dl) requiring haemodialysis over the next 5 days. A coagulation screen revealed an abnormal prothrombin time and activated potential thromboplastin time. On day 6, the patient also developed melaena with abdominal distention and tenderness. A non-contrast CT scan of the chest and abdomen was done which did not reveal perforation of a hollow viscus but showed ascites, and mild thickening of the wall of the small bowel loops and colon. She was started on total parenteral nutrition and a feeding jejunostomy was planned.

She required transfusion of multiple units of packed red cells and fresh frozen plasma. At the time of surgery for feeding jejunostomy, gangrene of the small bowel was suspected and an emergency laparotomy was planned. However, the patient was critically ill with a serum creatinine of 10 mg/dl and abnormal coagulation parameters and a saline dialysis was done. The patient died of multi-organ failure before the site and extent of damage to the gastrointestinal tract could be identified and corrective surgery done.

DISCUSSION

MEKP liquid is used as a hardener and curing agent for plastics such as unsaturated polyester and fibreglass resins. In its pure form, it can explode from mechanical shock. Hence, it is usually available as a 40%–60% solution in dimethyl phthalate and is often stored in a refrigerator. It is postulated that the mechanism of toxicity of MEKP is by free radical formation that leads to lipid peroxidation and results in corrosive injury to the gastrointestinal mucosa and liver.[2] The toxic oral dose of MEKP in dimethyl phthalate has been estimated to be 50–100 ml.[1]

However, ingestion of any amount of MEKP should be regarded as potentially serious.[2] Dimethyl phthalate, which is often added to solutions of MEKP as a plasticizer to reduce the risk of explosion, is commonly used as an insect repellent. It is generally thought to be of relatively low toxicity and is considered to be an irritant rather than corrosive.[3] Symptoms of acute MEKP poisoning by ingestion include gastrointestinal bleeding, necrosis and perforation of the stomach, stricture of the oesophagus, severe metabolic acidosis, rapid liver failure, rhabdomyolysis and respiratory insufficiency.[1]

Our patient presented with upper gastrointestinal bleed and corrosive burns of the oral cavity. In addition, she also had raised AST/ALT and renal failure. The initial liver injury was most likely due to the ischaemic injury caused by hypotension. Renal failure in our patient was possibly due to severe hypotension and/or toxicity due to MEKP. Though she received lavage at a local hospital, gastric lavage and emesis are contraindicated after ingestion of a corrosive substance because of the risk of injury to the upper gastrointestinal tract.[4] Oral fluids should be avoided

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after ingestion of MEKP as in other corrosives. Patients should be monitored for respiratory, renal and liver dysfunction. A feeding jejunostomy may be useful for providing adequate enteral intake until the extent of the corrosive injury is ascertained. This may avoid the need for total parenteral nutrition and its associated complications. In our patient, gangrene of the bowel was suspected at the time of surgery for feeding jejunostomy.

Of the 25 cases of MEKP ingestion in the literature,[2,5–9] including our case, 8 adults (36%) died. Bates *et al*. reported accidental ingestion of MEKP in a 6-year-old boy who was hospitalized for more than 3 months and developed an oesophageal stricture requiring multiple dilatations.[2] Vitamin E and acetyl cysteine are possible therapies for MEKP toxicity.[10,11] However, there are no clinical data to support their use.

Many workers involved in lamination work do not know the adverse effects of the lamination liquid in case of accidental exposure. Though MEKP is widely available and used in India, poisoning due to MEKP ingestion has not been reported. Physicians managing this kind of corrosive injury should carefully monitor patients for complications such as gastrointestinal tract perforation, bowel gangrene and hepatic and renal failure. We recommend that bottles with MEKP should contain a warning to describe the adverse effects of its ingestion and the steps that need to be taken soon after injury.

REFERENCES

1 US National Toxicology Program. *Methyl ethyl ketone peroxide in dimethyl phthalate administered topically to F344/N rats and B6C F1 mice*. NTP Technical Report Series No. 18. DHHS (NIH) Publication No. 93-3341. NTP Research Triangle Park, NC, Feb 1993.
2 Bates N, Driver CP, Bianchi A. Methyl ethyl ketone peroxide ingestion: Toxicity and outcome in a 6-year-old child. *Pediatrics* 2001;**108:**473–6.
3 Krauskopf LG. Studies on the toxicity of phthalates via ingestion. *Environ Health Perspect* 1973;**3:**61–72.
4 American Academy of Clinical Toxicology, European Association of Poisons Centres and Clinical Toxicologists Position statement: Gastric lavage. *Clin Toxicol* 1997;**35:**711–19.
5 Karhunen PJ, Ojanpera I, Lalu K, Vuori E. Peripheral zonal hepatic necrosis caused by accidental ingestion of methyl ethyl ketone peroxide. *Hum Exp Toxicol* 1990;**9:** 197–200.
6 Mittleman RE, Romig LA, Gressman E. Suicide by ingestion of methyl ethyl ketone peroxide. *J Forensic Sci* 1986;**31:**312–20.
7 Deisher JB. Poisoning with liquid plastic catalyst: Report of a case. *Northwest Med* 1958;**57:**46.
8 Dines DE, Shipman K. Toxic myocarditis: Report of a case arising from ingestion of liquid plastic catalyst. *Angiology* 1962;**13:**297–302.
9 Prez-Martnez A, Gutirrez-Junquera C, Gonzlvez-Piera J, Marco-Macin A, Rubio-Guijarro JR, Moya-Marchante M. Oesophageal stenosis in a child caused by ingestion of methyl ethyl ketone peroxide. *Eur J Pediatr* 1997;**156:**976–7.
10 Litov RE, Matthews LC, Tappel AL. Vitamin E protection against *in vivo* lipid peroxidation initiated in rats by methyl ethyl ketone peroxide as monitored by pentane. *Toxicol Appl Pharmacol* 1981;**9:**96–106.
11 Chyka PA, Butler YA, Holliman BJ, Herman MI. Utility of acetylcysteine in treating poisonings and adverse drug reactions. *Drug Saf* 2000;**22:**23–48.