
Selected Topics: Toxicology

HEMORRHAGIC GASTRITIS AND GAS EMBOLI AFTER INGESTING 3% HYDROGEN PEROXIDE

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□ **Abstract**—It is well known that ingestion of low concentrations of hydrogen peroxide is usually nontoxic; this does not produce gas embolism and is only a mild irritant to the gastrointestinal tract. We report the case of a 25-year-old woman who ingested one mouthful of 3% hydrogen peroxide and presented to the Emergency Department with persistent vomiting and epigastric pain. The radiographic evaluation found portal venous gas emboli. In addition, upper gastrointestinal endoscopy performed 2 h after ingestion revealed diffuse hemorrhagic gastritis. She showed a decrease of hemoglobin concentration and a positive test result for occult blood in stool. She was observed for 14 days and discharged. Follow-up endoscopy showed erythematous gastritis. This case illustrates that a low concentration of hydrogen peroxide can cause portal venous gas embolism and severe gastrointestinal injuries even if only a small amount is ingested. © 2006 Elsevier Inc.

□ **Keywords**—hydrogen peroxide; gas embolism; gastritis; upper gastrointestinal bleeding; endoscopy

INTRODUCTION

A case is reported illustrating that low concentration hydrogen peroxide can cause systemic gas embolism and severe gastrointestinal injuries even if only a small amount of this chemical is ingested.

CASE REPORT

A 25-year-old woman who had ingested a colorless liquid when acting on a moment's suicidal impulse, was taken to an Emergency Department by her parents, who brought along the bottle of ingested solution. Her parents stated that she had ingested only one mouthful of this chemical due to their deterrence. By observing the bottle they brought, we found that this liquid was 3% hydrogen peroxide, which is commonly used as a household disinfectant, and the ingested amount was approximately 40 mL.

She complained of epigastric pain and persistent vomiting that was accompanied with a small amount of blood. Her past medical history did not reveal any significant illness.

On arrival, 50 min after drinking the hydrogen peroxide, her vital signs were: blood pressure 120/70 mm Hg, temperature 36°C (96.8°F), pulse 95 beats/min, and respiratory rate 26 breaths/min. She was alert and oriented to time, person and place. On physical examination, the patient's lungs were clear and the heart sounds were normal. Her abdomen was soft and not distended; bowel sounds were increased, and she had mild tenderness in the epigastric area. The hemoglobin concentration was 12.3 g/dL. The amylase concentration was elevated to 137 U/L (20.0–100.0 U/L). However, the other

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Figure 1. X-ray study of the abdomen showing a linear air density in the right upper quadrant of abdomen (black arrows) and bowel dilatation.

laboratory results including arterial blood gas, serum electrolyte, lipase and liver enzymes were within normal limits. The test result for pregnancy was negative.

A nasogastric tube was inserted to decompress the gastrointestinal tract.

Radiographs of the abdomen and chest demonstrated a linear air density at the right upper quadrant of the abdomen, and bowel dilatation was noted (Figure 1). A computed tomography (CT) scan of the abdomen was then done. The results of the abdominal CT scan were consistent with the findings for portal venous gas, which was a peripheral pattern of gas distribution in the liver (Figure 2).

Echocardiography was performed to evaluate for the possibility of gas embolism; however, we did not find any such abnormality.

The upper gastrointestinal endoscopy, 2 h after peroxide ingestion, revealed multiple large round mucosal erosions in the distal esophagus and diffuse hemorrhagic gastritis involving the entire gastric mucosa. The duodenal bulb was eroded and edematous.

The patient was treated with high oxygen therapy and started on parenteral nutrition. A follow-up abdominal

radiograph after 48 h showed complete resolution of the portal venous gas.

Two days after admission, however, the hemoglobin concentration decreased to 9.9 g/dL and the test result for occult blood in the stool was positive. Conservative treatment was started with i.v. ranitidine and oral coagulant. There was no further change of the hemoglobin concentration. The patient was able to tolerate an oral intake by Day 6 of her hospital stay. The subsequent clinical course was favorable.

Another upper gastrointestinal endoscopy on Day 14 showed erythematous gastritis and resolution of the esophageal lesion. She was discharged from the hospital 14 days later.

DISCUSSION

Hydrogen peroxide is a colorless and odorless liquid with concentrations ranging from 3% to 60%. Low concentrations of this chemical are used in hospitals for the removal of tissue debris and a weak germicide effect; this concentration is also used as a household product, usually as a bleach for clothes and hair. The high concentration (higher than 10%) is a strong oxidizing agent that is used as a bleaching agent in textile and paper industries. This concentrated form is also used in the production of rocket fuel and foam rubber.

Hydrogen peroxide rapidly decomposes to water and oxygen on contact with organic tissue when abundant catalase is present. The amount of liberated oxygen correlates with the concentration of hydrogen peroxide; 1 mL of 3% hydrogen peroxide can generate approximately 10 mL of oxygen at standard temperature and



Figure 2. CT scan of the abdomen demonstrating portal venous gas emboli consistent with peripheral pattern of gas distribution in the liver (black arrows).

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