

Cetrimide-chlorhexidine-induced multiorgan failure in surgery of pulmonary hydatid cyst

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ABSTRACT

Savlon (0.5% cetrimide/0.05% chlorhexidine) is used as a scolicalid during surgery of hydatid cysts. It is considered a safe and effective agent. However, there are no recommendations for the appropriate concentration or dosage of these agents. Previously reported to cause severe metabolic acidosis, its effects on the pulmonary system have not been explored. We present a case of acute lung injury and respiratory distress along with acute cardiopulmonary distress, severe metabolic acidosis, and renal failure following its use during surgical removal of pulmonary hydatid cyst. The agent may act as a chemical sclerosant causing pulmonary parenchymal damage through bronchial openings present in the pericyst. Till safe dose limits are known, use of this agent should be limited, especially in large or multiple cyst surgery.

Key words: Acute lung injury; Hydatid cyst sclerosant; Metabolic acidosis; Renal failure; Savlon (0.5% cetrimide/0.05% chlorhexidine)

Received: 24-03-15
Accepted: 29-04-16

INTRODUCTION

Scolicalid agents are used to sterilize the cyst and prevent intraoperative dissemination of the parasite. Many agents have been recommended; savlon 10% a combination of 3% cetrimide w/v and chlorhexidine gluconate 1.5% w/v is commonly used. The low toxicity, rapid action against the protoscolices, and scolicalid effect at low concentration have been studied previously; there are no guidelines on the concentration and volume of the agent that can be used safely.^[1-4]

We present an interesting case report of a 25-year-old male patient operated for the removal of hepatic and pulmonary hydatid cysts, who developed acute renal failure, severe metabolic acidosis, shock, and acute lung injury due to cetrimide use, resulting in a protracted course in the Intensive Care Unit (ICU).

CASE REPORT

Presenting concerns and clinical findings

A 25-year-old Indian male teacher presented with intermittent dull aching pain in the

left chest for 1 month. The pain nonradiating in nature. There was no history of fever, cough with expectoration, loss of appetite, or recent weight loss. A nonsmoker without no addictions or animals contact. Only significant clinical finding was reduced air entry on the left basal region, with no localized tenderness.

Diagnostic focus and assessment

Blood investigations (hemogram, renal and liver function tests) were within normal limits. Chest X-ray showed a well-defined opacity in the left lower lobe [Figure 1]. Ultrasonogram

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Cite this article as: Tripathy S, Sasmal P, Rao PB, Mishra TS, Nayak S. Cetrimide-chlorhexidine-induced multiorgan failure in surgery of pulmonary hydatid cyst. *Ann Card Anaesth* 2016;19:557-60.

Access this article online

Website: www.annals.in

DOI:
10.4103/0971-9784.185565

Quick Response Code:





Figure 1: Chest X-ray showing hydatid cyst in the left lower lobe

of abdomen revealed a cystic lesion in the segment 8 of liver, suggestive of hydatid cyst. Computerized tomography (CT) scan of abdomen and thorax showed a 97 mm × 89 mm × 74 mm unilocular cystic lesion with enhancing peripheral walls in the left lower lobe of the lungs and 61 mm × 60 mm × 44 mm cyst in the segment VIII of liver abutting the diaphragm. Thin-walled daughter cysts were seen within the cyst [Figure 2a and b].

Perioperative phase

The patient was advised oral albendazole 400 mg twice daily for 21 days continued for 8 weeks after surgery (excision of hepatic hydatid cyst followed by a left posterolateral thoracotomy for the pulmonary cyst).

Surgical procedure

Injection midazolam, ondansetron, and butorphanol were administered preoperatively as per protocol. Induction of anesthesia was with injection propofol 2 mg/kg and paralysis with injection vecuronium 6 mg. Anesthesia was maintained with isoflurane and nitrous oxide. The patient was intubated with 8.5 mm single lumen endotracheal tube fixed at 22 cm. Postinduction the right subclavian vein and right radial artery were cannulated.

Abdomen was explored by the right subcostal approach. Savlon (3% cetrimide - 1.5% chlorhexidine), diluted 1:1 with normal saline was used as scolicidal agent (20 ml in packs in the abdominal cavity and 40 ml to irrigate the cyst cavity). The cyst was sterilized by aspirating some fluid and replacing with scolicidal solution for 10 min. Partial pericystectomy and evacuation of the remaining daughter cysts and germinal

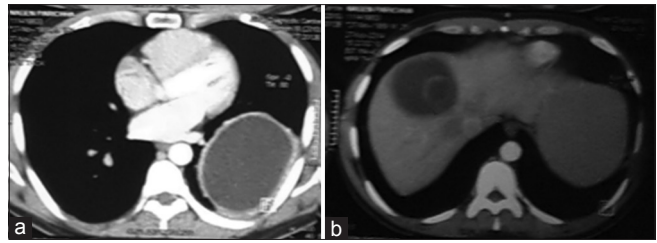


Figure 2: (a and b) Computerized tomography scan image of the hydatid cysts in the lungs and liver

membranes were done. The cavity was inspected for bile leak and closed with external drainage.

For the pulmonary cyst, aspiration was followed by instillation of 60 ml half strength savlon. After reaspiration of the pulmonary cyst contents, the pericyst was opened to evacuate the residual daughter cysts. Multiple bronchial openings revealed at this stage were meticulously suture closed, and the residual cyst cavity was obliterated by imbricating sutures from within (capitonnage technique). The incision was closed in layers with chest tube placed. The entire procedure lasted for 150 min.

Intraoperative events

During thoracotomy, patient developed tachycardia. Blood gas revealed severe metabolic acidosis with a pH/PaO₂/PaCO₂/base excess - 7.03/118/64/-10.8, respectively. Lactate was 1.8 mmol/L. Oxygenation deteriorated suddenly during irrigation of the cyst with scolicidal solution. Pink frothy secretions from the endotracheal tube and diffuse bilateral crepitation in the lung fields were noted. Ectopic beats and severe hypotension followed, requiring infusion of a high dose of adrenaline (0.2–0.5 U/min). Transthoracic ultrasonogram demonstrated bilateral B-lines with good left ventricular function suggesting noncardiogenic pulmonary edema.

Postoperative

The patient was shifted to the intensive care on vasopressors for ventilation. Nonoliguric renal failure (immediate postoperative serum creatinine 1.8 mmol/dL and 2.4 mmol/dL on day 1) and severe metabolic acidosis (pH 7.1) normalized over 10 and 48 h, postoperatively. High-grade fever with normal white cell counts and sterile blood, urine, and endotracheal tube cultures was seen in early ICU stay. A diagnosis of chemical pneumonitis and acute respiratory distress syndrome (ARDS) was made based on the clinical (PaO₂/FiO₂ <100 mmHg) and radiologic picture. This progressed over 4 days [Figure 3a and b]. PaO₂/FiO₂

ratio improved from 60 to 150 over 10 days when the patient was extubated.

At 7 days of ICU discharge, the patient had tachypnea with residual pulmonary parenchymal changes on the CT scan suggestive of recovering acute lung injury [Figure 4]. At 1 month of follow-up, he was back to his preoperative state and doing well [Figure 5].

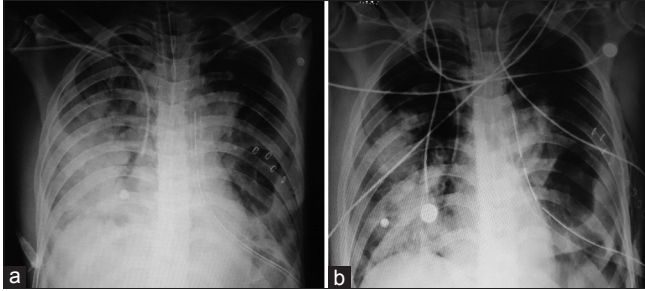


Figure 3: (a and b) Chest X-ray on day 1 and day 5 after the surgery showing bilateral diffuse fluffy opacities



Figure 4: Computerized tomography scan taken 1 week after discharge from the Intensive Care Unit showing pulmonary parenchymal sequelae of acute lung injury – reticular shadows and ground glass appearance

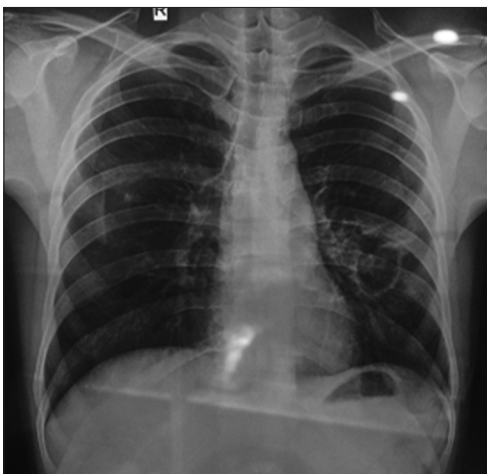


Figure 5: Chest X-ray at 1 month follow-up

DISCUSSION

Our patient underwent a single-stage surgery for hepatic (segment VIII) and pulmonary (left lower lobe) hydatid cysts. He developed severe metabolic acidosis (pH 7.03) with normal serum lactate, hemodynamic instability, acute renal failure, and acute lung injury.

Hydatid cyst fluid being highly antigenic can cause anaphylactic shock. Key diagnostic features of anaphylaxis absent in our case were spillage of cyst fluid, cutaneous signs, angioedema, bronchospasm, generalized erythema, and raised serum lactate. Further, the stable body temperature and end-tidal gases ruled out malignant hyperthermia associated metabolic acidosis. Acute myocardial infarction or tension pneumothorax was similarly ruled out by table side transthoracic echocardiography.

To the best of our knowledge, the noncardiogenic pulmonary edema and ARDS are the first such reported events during the surgical excision of a pulmonary hydatid cyst. Larger pulmonary hydatid cysts (10 cm diameter) are associated with greater complications during surgery.^[5] Bronchial openings in the pericystic cavity may allow entry of the scolical agent into the lung parenchyma resulting in severe chemical pneumonitis. The use of scolical agents in hepatic hydatid cyst disease (formaldehyde, hypertonic saline, etc.) are reported to cause sclerosing cholangitis in cysts with biliary duct communication and fibrosing peritonitis when used for peritoneal washout.^[6-8] We postulate that cetrimide leaking into the parenchyma of bilateral lungs because of undetected cyst bronchial connection resulted in acute lung injury which progressed for the next few days and left radiologic sequelae even after discharge from the ICU. It is possible that the use of a double lumen endotracheal tube may have resulted in better protection of the contralateral lung; a double lumen tube, however, is associated with its own complications.^[9,10]

Stable total cell counts and culture negative tracheal aspirate ruled out an infectious etiology of ARDS. Recovery with steroids and protective lung ventilation ensued over 10 days.

Tested safe in animal studies, there are no recommendations for the upper limit of volume or concentration of cetrimide-chlorhexidine in human

beings.^[1,2,11] Complications have occurred with as low as 0.5% cetrimide and have included coma, hemolysis, and death.^[12-15] Metabolic acidosis and acute renal failure are known.^[16-18] Puj and Chauhan reported having used 120 ml of 0.5% cetrimide during 2 h of surgery, resulting in delayed reversal, metabolic acidosis and nonoliguric renal failure needing ICU over 10 days.^[16] Sathyanarayana *et al.* accept that the cause in their case might have been “liberal use” of cetrimide.^[17] In our patient, the metabolic acidosis was detected immediately after the abdominal phase of the surgery, when the patient was hemodynamically stable, implicating cetrimide solution as the cause of the acute renal failure and acidosis in the background of normal serum lactates.

CONCLUSION

Regulated volume and concentration of cetrimide-chlorhexidine solution are needed, especially in cases with large, multiple, or pulmonary cysts with possible bronchial communication. Anticipation of systemic complications and the use of double lumen tubes may be considered. Research on the safe limits of scolicedal agents used may be undertaken in the future.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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