

Life Threatening Hemoperitoneum and Liver Injury as a Result of Chest Tube Thoracostomy

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ABSTRACT: Common complications of chest tube thoracostomy (CTT) include lung laceration, chest wall bleeding, improper position of tube, subcutaneous emphysema, and so on. Although intra-abdominal injury because of CTT was possible in stomach, spleen, and liver, published reports are rare and no case of life-threatening hemoperitoneum because of CTT has been published in the literature. Here, we present a rare case of life-threatening hemoperitoneum and liver injury because of CTT. We successfully treated the case with emergent laparotomy. Owing to great rarity and particular rare complication of CTT, we report this case with a review of literature.

KEYWORDS: hemoperitoneum, liver injury, thoracostomy

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Introduction

Common complications of chest tube thoracostomy (CTT) include lung laceration, chest wall bleeding, improper position of tube, subcutaneous emphysema, and so on.¹

Although intra-abdominal injury because of CTT was possible in stomach, spleen, and liver, published reports are rare and no case of life-threatening hemoperitoneum because of CTT has been published in English literature.

We recently experienced a 72-year-old female patient diagnosed with massive hemoperitoneum and liver injury because of CTT. We successfully treated this patient with laparotomy. This report concerns a rare case of life-threatening hemoperitoneum and liver injury because of CTT, including imaging and review of the literature. The patient has given consent for the publication of this report.

Case Report

A 72-year-old female came to the emergency department because of a pedestrian traffic accident. She was diagnosed with a right distal femur fracture, right clavicle fracture, left femur fracture, and pelvic bone fracture. Initial abdomen computed tomography (CT) scan showed no fluid collection in the abdominal cavity (Fig. 1A).

Her general state was aggravated because of ongoing bleeding in the injured pelvic bone area. She was admitted to the intensive care unit (ICU). Acute renal failure (ARF) and respiratory failure developed in the ICU because of ongoing bleeding and vigorous fluid resuscitation. Hemodialysis and mechanical ventilation were applied.

On hospital day 5, open reduction of a fractured bone was performed. On hospital day 6, chest radiograph at morning showed right lung haziness, suggesting pleural effusion. CTT was performed for resolving right pleural effusion.

Under local anesthesia, a small incision was made in the skin parallel to the sixth rib, just anterior to the mid-axillary line and well below the pectoralis major muscle mass and breast. Using a clamp, a subcutaneous tract was tunneled posteriorly along the chest wall. The pleural space was entered just over the superior rib margin using a trocar-type chest tube. However, pleural fluid was not drained. Therefore, insertion site compression was performed for several minutes and was closed completely by suture. A second CTT was performed in the fifth rib skin area, and pleural fluid was drained. The second CTT was performed successfully without any complication.

Approximately 90 minutes later, she developed abdomen distension. Blood pressure was 60/40 mmHg. In follow-up laboratory findings, serum hemoglobin was decreased to 6.1 g/dL compared to 9.7 g/dL in the morning's laboratory finding. Operative wound site of open reduction operation was clear and with non-specific bleeding sign. Abdomen CT was performed immediately. Abdomen CT showed massive fluid collection and contrast extravasation from the liver surface (Fig. 1B), suggesting hemoperitoneum and chest tube location was intra-thoracic cavity (Fig. 2). Emergent laparotomy was performed. Initially, approximately 2500 cc blood was drained from the abdominal cavity.

A blood pumping lesion was detected on the liver surface of segment 6 and about 1 cm sized.

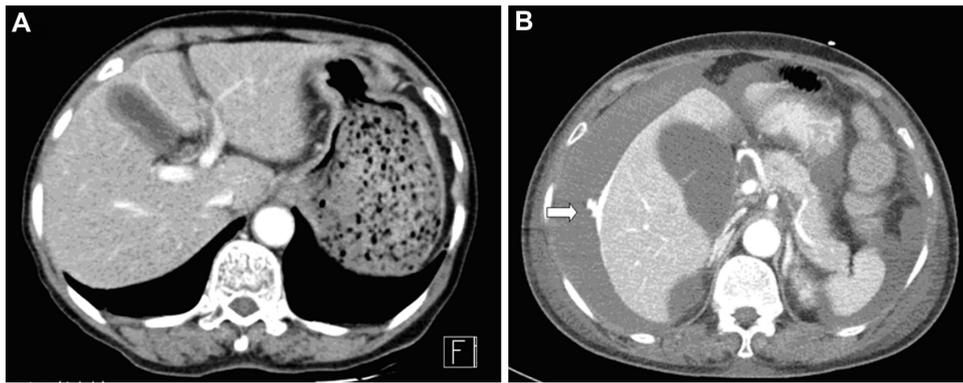


Figure 1. The CT finding. (A) The initial CT scan in the emergency department reveals no fluid collection in the perihepatic area. (B) The CT scan reveals massive fluid collection, and the white arrow indicates contrast extravasation from the liver surface.

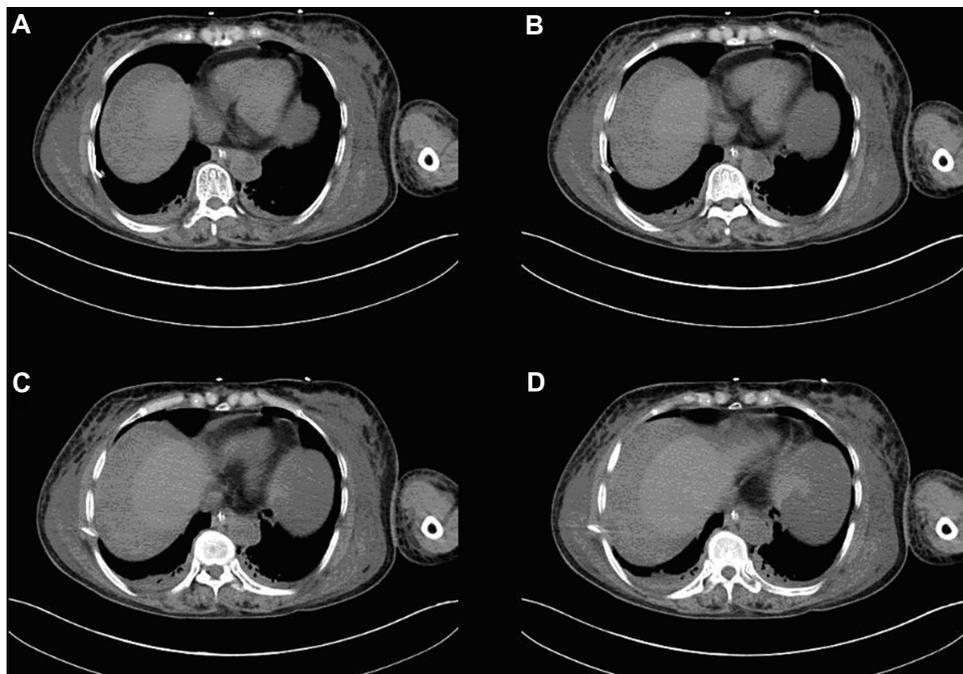


Figure 2. The chest tube location. (A–D) The CT scan revealed proper location and tract of the right chest tube.

Based on these operative findings, we considered penetrating liver injury because of CTT.

Therefore, bleeding focus was controlled by electronic cauterization and an absorbable fibrin sealant patch (TachoSil® Baxter). After operation, the patient's postoperative course was uneventful.

Discussion

CTT is a common bedside procedure in surgical patients. Although CTT was performed frequently in surgical patients, several complications can occur with CTT, including lung laceration, chest wall bleeding, improper position of tube, subcutaneous emphysema, and so on.¹

The overall complication rate of CTT is 1–36% in previously published literature.^{2–4} The most common injury

because of CTT is direct lung injury. Although intra-abdominal injury because of CTT is possible in stomach, spleen, and liver, the published reports of life-threatening intra-abdominal injury are very rare. Therefore, the CTT-induced liver injury rate was not reported in the literature. A retrospective study of 447 patients of CTT reported only 1 patient with liver laceration.² However, no case of CTT-induced life-threatening hemoperitoneum and liver injury was published in English literature.

The mechanism of CTT-induced liver injury is a penetrating injury mechanism. The mechanism of CTT-induced penetrating liver injury is similar to that of percutaneous liver biopsy-induced liver injury. Also, rarely, percutaneous liver biopsy-induced life-threatening hemoperitoneum and liver injury has been reported in the literature.⁵



The common clinical manifestation of CTT-induced liver injury is intra-abdominal bleeding. If bleeding is minimal, clinical deterioration is minimal. However, if there is a large amount of bleeding, the patient can develop sudden clinical deterioration, including abdomen distension, abdominal pain, hypovolemic shock, and diverse shock-related symptoms and signs.

A sudden deterioration of the general condition of the patient following a CTT should arouse suspicion of complications. In principle, prompt diagnostic procedures, such as chest radiograph, abdomen radiograph, or abdomen CT, are needed.

In hemoperitoneum, traditional treatment is open laparotomy and bleeding control. However, according to some clinicians, laparoscopic management may be an alternative for hemoperitoneum in stable patients.⁶ In liver biopsy-induced penetrating liver injury, laparoscopic management was performed successfully.⁷

Although emergency laparotomy was performed in our patient, when the clinician well understood the cause of injury, injury site, and bleeding focus, laparoscopic management was available.

We controlled bleeding using an absorbable fibrin sealant patch. The use of the absorbable fibrin sealant patch resulted in achievement of significantly fast hemostasis in liver resection.⁸

CTT-induced intra-abdominal organ injury can be prevented by the use of a high approach and insertion of the chest tube at or above the inter-mammary line in the fourth or fifth intercostal space.⁹ An effective method is to place the skin incision in the fifth or sixth intercostal space, and then tunnel up over the rib and insert the tube through the next higher interspace.⁹

In conclusion, CTT is one of the frequently performed bedside procedures. Common complications of CTT include lung laceration, chest wall bleeding, improper position of tube, and subcutaneous emphysema. However, we describe a rare case with a review of the literature so that lethal complications such as hemoperitoneum and liver injury because of CTT and its adequate treatment should be understood.

Author Contributions

Conceived the concepts: JMB. Wrote the first draft of the manuscript: JMB. Made critical revisions and approved final version: JMB. The author reviewed and approved of the final manuscript.

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