Pleural empyema caused by dropped gallstones after laparoscopic cholecystectomy for acute cholecystitis: a case report

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Abstract

Background: Dropped gallstones during laparoscopic cholecystectomy (LC) sometimes induce postoperative infectious complications. However, pleural empyema rarely occurs as a complication of LC.

Case presentation: We present the case of a 66-year-old woman with right pleural empyema. She previously underwent LC for acute gangrenous cholecystitis 11 months ago. The operative report revealed iatrogenic gallbladder perforation and stone spillage. The bacterial culture of the gallbladder bile was positive for Escherichia coli. Chest and abdominal computed tomography revealed right pleural effusion, perihepatic fluid collection, and multiple small radiopaque density masses. Although ultrasound-guided transthoracic drainage was performed, the drainage was incomplete, and systemic inflammatory reaction persisted. Consequently, thoracotomy and laparotomy with gallstone retrieval were performed, and the patient recovered completely. The patient has remained well without complications after 14 months of follow-up.

Conclusions: We report a rare case of pleural empyema caused by dropped gallstones after LC. This case emphasized the importance of completely retrieving the dropped gallstones to prevent late infectious complications after LC.

Keywords: Pleural empyema, Dropped gallstone, Acute cholecystitis, Laparoscopic cholecystectomy

Background

Laparoscopic cholecystectomy (LC) is the gold standard for cholelithiasis owing to shorter postoperative stay and fewer complications [1–3]. Furthermore, LC is the first treatment option for acute cholecystitis [4]. However, intraoperative gallbladder perforation and gallstone spillage sometimes occur during LC [5, 6].

Dropped gallstones during LC sometimes induce postoperative infectious complications, such as abdominal abscesses [7]. However, pleural empyema rarely occurs as a complication of LC. This study aimed to highlight the potential risk of dropped gallstones in the patients’ postoperative course and to provide a review of literature on pleural empyema caused by dropped gallstones during LC.

Case presentation

A 66-year-old woman was referred to our hospital because of right upper abdominal pain, right chest pain, and dyspnea. Her past medical history included hypertension, primary biliary cirrhosis, and rheumatoid arthritis (RA), treated with a steroid agent and interleukin-6 (IL-6) inhibitor. In addition, LC was performed for acute gangrenous cholecystitis 11 months earlier (Fig. 1). The operative report revealed iatrogenic gallbladder...
perforation and stone spillage due to severe regional inflammation. The bacterial culture of the gallbladder bile tested positive for *Escherichia coli*. Tazobactam/piperacillin was administered from the time of surgery to postoperative day 7. Although the inflammatory markers such as white blood cell counts and C-reactive protein were improved, she had persistent fever. Computed tomography (CT) was performed and multiple dropped stones were found. However, abdominal abscess was not found on CT. Upon receiving the culture results, meropenem was administered for the next 10 days. She was discharged from the hospital on postoperative day 21.

Chest radiography revealed a right pleural effusion (Fig. 2a). Chest CT revealed a right pleural effusion with passive atelectasis (Fig. 2b). Furthermore, abdominal CT showed perihepatic fluid collection and multiple small radiopaque density masses (Fig. 2c). The patient was treated with an antimicrobial agent (meropenem), and ultrasound-guided transthoracic drainage was performed. The bacterial culture of pleural effusion was positive for *Escherichia coli*, which was consistent with the culture result of the gallbladder bile in acute cholecystitis. However, the drainage was incomplete, and the prescribed treatments did not alleviate the inflammatory reaction. Consequently, thoracotomy and laparotomy with gallstone retrieval were performed. In laparotomy, the abscess in the Morrison's fossa was opened and drained, and dropped stones around the liver were removed (Fig. 3a–c). The thoracic cavity was covered with membranous necrotic tissue, and a multilocular abscess was observed. However, there was no communication between the thoracic cavity and the abdominal cavity and there were no stones in the thoracic cavity (Fig. 3d). The patient's symptoms, pleural effusion, and perihepatic fluid collection completely resolved after surgery. The patient has remained well without complications after 14 months of follow-up.

**Discussion**

This study highlighted two significant findings. First, pleural empyema occurred owing to delayed-onset gallstone formation after LC for acute cholecystitis. Second, complete removal of dropped gallstones was the only curative treatment for pleural empyema.

LC has become the gold standard treatment for cholelithiasis [1–3]. The application of LC for acute
cholecystitis has increased owing to improvements in the procedure and reduced postoperative hospital stay. However, difficult LC cases, such as necrotic cholecystitis, have been encountered [8]. Iatrogenic gallbladder perforation reportedly occurred in 10–30% of LC procedures [5]. Moreover, the incidence of dropped gallstones was reportedly 5.4–19%, and 1.1–2.3% of dropped gallstones persisted [6].

The incidence of abdominal abscess formation after LC is reportedly low at 0.08%. However, this increases to 1.46% when dropped gallstones are not retrieved [7]. Therefore, 76.8% of surgeons have followed up their patients with dropped gallstones two years after LC owing to concerns regarding abdominal infections [9].

The development of pleural empyema after LC has rarely been reported, with only 13 previous cases [10–22]. The clinical features of pleural empyema, caused by dropped gallstones after LC, are summarized in Table 1. The median age of the patients was 68 years (range, 53–83 years). The etiologic agents were Escherichia coli in five cases, Klebsiella spp. in four cases, Enterococcus spp. in two cases, and Salmonella spp. in one case. The median period from LC to abscess formation was 17 months (range, 1.5–63 months).

The mechanisms that the abdominal infection causes the pleural empyema were reported as follows [23, 24]: first, a port of laparoscopic surgery or a drainage tube may be placed via the thoracic cavity. Second, the diaphragm has congenital defect, such as the esophageal hiatus and the aortic hiatus. Third, inflammation may have destroyed the diaphragm and formed a fistula. Finally, bacteria may have entered the thoracic cavity through the lymphatic network that is abundant in the diaphragm. However, in our case, cholecystitis was not previously treated with percutaneous transhepatic gallbladder drainage and

![Fig. 2 Chest radiography and CT at the time of pleural empyema diagnosis.](image-url)
there was no transthoracic port in laparoscopic cholecystectomy. In the previous reports, the fistula which was caused by abdominal inflammation was identified in the diaphragm [11, 20, 22]. In contrast, the fistula could not be found in the diaphragm by the visual inspection and palpation in our case. Furthermore, there were no stones in the thoracic cavity on CT. However, it is difficult to identify the micro fistula intraoperatively. Therefore, we suspected that there was the micro fistula between the abdominal abscess and thoracic cavity. Furthermore, ultrasound-guided transthoracic drainage and antimicrobial agent were not effective enough because the abscess cavity was multilocular. In these aspects, we needed a thoracotomy with laparotomy for complete drainage.

Complete retrieval of dropped gallstones is necessary for the complete recovery of patients with pleural empyema or an abdominal abscess caused by dropped gallstones. The pathogenic bacteriologic profile of pleural empyema, caused by intra-abdominal infection, suggested an abdominal origin [23]. *Escherichia coli*, *Klebsiella spp.*, and *Enterococcus spp.* have been commonly isolated in acute cholecystitis [25]. In our case, the bacteriologic profile of pleural empyema was similar to that of the bile at the time of acute cholecystitis. However, the pleural empyema and abdominal abscess were not completely resolved despite abscess drainage and administration of the appropriate antimicrobials, as shown in Table 1. However, the pleural empyema and abdominal abscess were treated entirely with complete retrieval of the dropped gallstones. Therefore, dropped gallstones should always be retrieved. Furthermore, abscess formation, caused by dropped gallstones, requires a long time to develop. In these cases, a physician aside from the surgeon can detect the development of pleural empyema or an abdominal abscess. Therefore, all physicians should be informed that the treatment of an abscess, due to dropped gallstones, requires prompt and complete retrieval of the dropped gallstones.
In our case, IL-6 inhibitor is considered one of causes diagnosed after reaching pleural empyema. She started IL-6 inhibitor 2 months before the onset of empyema because her rheumatism worsened. While IL-6 inhibitors are highly effective biological drugs for RA, their anti-inflammatory effects masked the signs and symptoms of infection [26, 27]. She also had no fever even at the onset of empyema. Thus, exacerbation of the patient’s condition may have been avoided by recognizing the dropped stones as a source of infection and IL-6 inhibitors as a risk factor for severe infection.

**Conclusion**

We report a case of pleural empyema, caused by dropped gallstones during LC for acute cholecystitis. Physicians should keep in mind that dropped gallstones during LC can cause pleural empyema, even after several years. Complete retrieval of the dropped gallstones is necessary to cure pleural empyema and abdominal abscess.

**Abbreviations**

LC: Laparoscopic cholecystectomy; RA: Rheumatoid arthritis; IL-6: Interleukin-6.

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![Table 1](image-url)  
**Table 1** Literature review of pleural empyema caused by dropped gallstones during laparoscopic cholecystectomy

| Author | Age (years)/sex | Interval time from cholecystectomy | Treatment for pleural empyema | Complete retrieval of gallstones | Effect of treatment |
|--------|-----------------|-----------------------------------|-----------------------------|-----------------------------|---------------------|
| 1      | Leslie [10]     | 58/male                           | 1st Thoracotomy             | No                          | Failure             |
| 2      | Barnard [11]    | 54/female                         | 1st Thoracotomy             | Yes                         | Success             |
| 3      | Willekes [12]   | 83/female                         | 1st Thoracotomy             | Yes                         | Success             |
| 4      | Chopra [13]     | 64/female                         | 1st Drainage                | Yes                         | Success             |
| 5      | Peciado [14]    | 71/male                           | 1st Drainage                | No                          | Failure             |
| 6      | Roberts [15]    | 64/male                           | 1st Use of antimicrobials    | No                          | Failure             |
| 7      | Bergeron [16]   | 72/female                         | 1st Drainage                | No                          | Failure             |
| 8      | Cheah [17]      | 72/male                           | 1st Thoracotomy (VATS)       | Yes                         | Success             |
| 9      | Quail [18]      | 66/female                         | 1st Use of antimicrobials    | No                          | Failure             |
| 10     | Gaster [19]     | 72/male                           | 1st Drainage                | No                          | Failure             |
| 11     | Robinson [20]   | 53/male                           | 1st Thoracotomy             | Yes                         | Success             |
| 12     | McPherson [21]  | 83/male                           | 1st Drainage                | No                          | Failure             |
| 13     | Tchercansky [22]| 69/male                           | 1st Drainage                | No                          | Failure             |
| 14     | Our case        | 66/female                         | 1st Thoracotomy (VATS)       | Yes                         | Success             |

VATS: video-assisted thoracic surgery, N/A: not available

**Author contributions**

AT and HM described and designed the manuscript. MT revised the manuscript. RK and HY performed the initial medical care and transthoracic ultrasound-guided drainage. HI, HM, NN, TM, KT, SK, TM performed surgery and postoperative management. All authors read and approved the final manuscript.

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**Availability of data and materials**

Data sharing is not applicable as no datasets were generated analyzed during the current study.

**Declarations**

**Ethics approval and consent to participate**

Not applicable.

**Consent for publication**

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

**Competing interests**

The authors declare that they have no competing interests.

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