Case Report

Boerhaave syndrome presenting black pleural effusion: A case report

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ABSTRACT

A 55-year-old man experienced nausea and vomiting after brushing his teeth. He experienced back pain after this episode and visited our emergency department. Chest computed tomography (CT) images revealed moderate pleural fluid accumulation and mild left pneumothorax. Thoracentesis showed black pleural effusion. Thoracic drainage included food debris with black pleural effusion, and gastroscopy revealed food debris and perforation of the lower esophagus. Esophageal perforation was surgically repaired using omental implantation and pleurolysis. Given the high mortality rate associated with black pleural effusion, prompt diagnostic procedures and corresponding management are essential.

1. Introduction

Boerhaave syndrome (BS) is a life-threatening disease when not treated promptly. Early diagnosis is important but difficult in many cases. We report a patient presenting with black pleural effusion, which helped in the diagnosis of BS.

2. Case presentation

A 55-year-old man with no relevant medical history experienced nausea and vomiting after brushing his teeth. He had consumed no alcohol nor overdosed on drugs on the day. He experienced back pain after these episodes and visited our emergency department. He was awake and alert, with a blood pressure of 136/77 mmHg, pulse rate of 79/min, and percutaneous oxygen saturation of 93% under room air inhalation. The patient’s axillary temperature was 37.5 °C. Breath sounds were audible in both lungs, and physical examination revealed no abdominal tenderness.

Computed tomography (CT) images of the chest obtained approximately 1 h after the onset of his symptoms revealed moderate pleural fluid accumulation (Fig. 1a) and mild pneumothorax (Fig. 1b). Myocardial infarction, acute pancreatitis, peptic ulcer perforation, aortic aneurysm dissection, and esophageal perforation were suspected based on observed symptoms. However, contrast CT detected only a slight progression of pneumothorax without mediastinal or subcutaneous emphysema. Electrocardiogram findings were

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non-specific. Blood tests showed an elevated white blood cell count (14400/μL). C-reactive protein, amylase, and lipase levels were within normal ranges. Thoracentesis was not performed, given that the patient could not rest owing to back pain. He was admitted and started on antibiotic treatment for suspected bacterial pleuritis, given the presence of low-grade fever, pleural effusion, and back pain.

The next day, 14 h after the onset of his back pain, thoracentesis was performed, revealing black pleural effusion (Fig. 2). The effusion was exudative with a high amylase level (Table 1). Cytology of the pleural effusion was negative. Chest radiography presented progression of the left pneumothorax and pleural effusion with a mediastinal shift to the right (Fig. 3). Tension pneumothorax was suspected, and thoracic drainage was performed as a chest tube thoracostomy using 20 French Gauge trocar catheter. The drainage included food debris with black pleural effusion, indicating esophageal rupture. Intubation with a nasogastric tube was performed, and black gastric fluid was extracted, matching thoracic drainage. Gastroscopy revealed food debris and perforation of the lower esophagus, leading to the diagnosis of BS. There was no erosion or malignant neoplasm detected in the esophagus.

Emergency surgery was performed on the same day. Black pleural effusion with food debris was observed in the left thoracic cavity, and perforation of the left wall of the lower esophagus was noted. Esophageal perforation was repaired using omental implantation and pleurolysis. Enteral nutritional support was initiated the next day, and oral intake started on day 14 of post-operation (POD). Antibiotic therapy was continued until POD19. The patient was discharged on POD29 without postoperative complications.

![CT images of the chest at initial presentation revealed moderate pleural fluid accumulation (a) and mild pneumothorax (b) in the left. CT, computed tomography.](image)

**Fig. 1.** CT images of the chest at initial presentation revealed moderate pleural fluid accumulation (a) and mild pneumothorax (b) in the left. CT, computed tomography.

| Biochemical data of the pleural fluid. | pH       | 7.003 |
|--------------------------------------|----------|-------|
| Total protein                        | 2.0      | g/dL  |
| Albumin                              | 0.9      | g/dL  |
| Lactose dehydrogenase                | 3104     | U/L   |
| Amylase                              | 13,169   | U/L   |
| - saliva                             | 99.0     | %     |
| - pancreas                           | 1.0      | %     |
| Lipase                               | 9        | U/L   |
| Triglyceride                         | 17       | mg/dL |
| Carcinoembryonic antigen             | 255      | ng/mL |
3. Discussion

Clinical discussion: BS is characterized by the rupture of the lower esophagus caused by a sudden increase in the intrathoracic pressure. The typical rupture site is the immediate supradiaphragmatic esophagus on the left side due to structural weakness of the portion [1]. Diagnosing BS as early as possible is crucial because it can cause secondary infection, spreading to the mediastinum and thoracic cavity; if diagnosis and therapeutic intervention are delayed, it leads to a high risk of mortality. The classic Mackler's triad, including vomiting, lower thoracic pain, and subcutaneous emphysema, has been reported in a few patients [2]. In the current case, the patient experienced a sudden onset of nausea, vomiting, and subsequent chest and back pain, and chest images demonstrated left pneumothorax and pleural effusion. BS was highly suspected as a differential diagnosis, and thoracentesis revealed a black pleural effusion containing food debris and elevated amylase, which were important clues for the diagnosis. He had no history of malignancy or erosion of the esophagus, which could increase the risk of rupture.

Image discussion: The typical CT findings of esophageal perforation include pleural effusion, pneumothorax, pneumopericardium, and mediastinal emphysema [3]. Pleural fluid released following esophageal perforation is usually acidic, containing undigested food particles [4,5]. In the current case, CT images showed pleural effusion and pneumothorax; however, we could not confirm the diagnosis before thoracentesis and gastroscopy owing to the lack of mediastinal emphysema.

Brief review of the literature: Black pleural effusion is a rare entity with limited clinical data. The causes of black pleural effusion include infection, rheumatoid arthritis, pleuroperitoneal fistula, and malignancy [6]. According to a recent case series of black pleural effusion, approximately half of the 32 cases were caused by malignant neoplasms, including malignant melanoma and lung cancer, and only one case of BS was documented [7]. Other diagnoses included pancreatic pseudocyst and *Aspergillus niger* empyema. Of the 32 cases mentioned above, five resulted in death. In the current case report, gastroscopy confirmed the diagnosis of BS, and surgical repair was successfully performed within 24 h from the onset, immediately after detection of a black pleural effusion. Regardless of the cause, black pleural effusion is a warning sign, and prompt diagnostic and therapeutic management should be performed.

4. Conclusion

We report the case of a patient presenting with black pleural effusion, which facilitated the diagnosis of BS. Owing to the high mortality rate associated with black pleural effusion, prompt diagnostic procedures, including detailed medical history, physical examinations, radiological and laboratory findings, and corresponding management, such as surgical intervention, are essential.

Consent

Written informed consent was obtained from the patient to publish this case report and accompanying images.

Author contributions

Conceptualization: Takaaki Tanaka, Data curation: Ryosuke Ikeuchi, Taisaku Koyanagi, Sae Wada, Hisaaki Tanaka, Hirofumi Tsugeno, Shinji Ozaki, Investigation: Kazuya Hisamatsu, Daisuke Mizuno, Toshiaki Morihiro, Takeshi Kurosaki, Futoshi Uno, Supervision: Masahiro Ishizaki, Hideyuki Nishi, Writing-original draft: Takaaki Tanaka, Kazuya Hisamatsu, Writing-review & editing: Nobukazu Fujimoto.

Authorship

TT, RI, KH, DM, TK, TM, TK, FU, SW, HT, HT, SO, MI, and HN contributed to the conception and design of the study, acquisition of data, and analysis and interpretation of data. TT and KH drafted the article or revised it critically for important intellectual content, and NF approved the final version to be submitted.
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The funding source was not involved in the study design; collection, analysis, and interpretation of data; writing of the report; and the decision to submit the article for publication.

Declaration of competing interest

All authors have no competing interests to declare.

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