

## Delayed Hemothorax Superimposed on Extrapleural Hematoma after Blunt Chest Injury: A Case Report

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We report a case showing delayed hemothorax superimposed on extrapleural hematoma after blunt chest injury. The patient was a 56-year-old man with a medical history of alcoholic hepatopathy who presented with a chief complaint of dyspnea on exertion. One month prior to presentation, he had sustained a fall that had resulted in left simple rib fracture. A chest radiograph taken at the time of injury showed notable reduction in the permeability of the left lung field along with high pulmonary collapse as well as rightward deviation of the shadow of the inferior mediastinum. Chest CT images showed a region of low absorption in the thoracic cavity with septi. Thoracic drainage was performed (1,300 mL total) and hemothorax was diagnosed. Thoracoscopic examination was then performed. When the inside of the thorax was observed, what had been presumed to be the septi of a multilocular fluid collection was found to be actually the parietal pleura, and a hematoma was confirmed inside the extrapleural cavity. The hematoma inside the extrapleural cavity was managed with lavage and drainage, and drainage tubes were placed inside both the thoracic cavity and extrapleural cavity at the end of the procedure. The patient's postoperative course was uneventful, and he was discharged on postoperative day 4.

**Key words:** Blunt chest injury, delayed hemothorax

### INTRODUCTION

Delayed hemothorax accompanying blunt chest injury is a rare condition. In imaging, hematomas with septi are presumed to be multilocular, which is considered to be associated with poor drainage. In this case, we confirmed the presence of septi of the parietal pleura accompanying extrapleural hematoma by means of thoracoscopic surgery, and we present the details of the case in this report.

### CASE REPORT

**Patient:** A 56-year-old man.

**Main complaint:** Dyspnea on exertion

**Medical history:** Alcohol hepatopathy

#### History of current disease:

The patient presented to our department with a chief complaint of dyspnea on exertion after having sustained a fall that caused an injury to the left chest about 1 month prior. At the time of the injury, he presented to his local clinic and chest radiographs revealed a left 10<sup>th</sup> rib fracture. However, visible shifting pieces of fractured ribs or reduced permeability associated with bleeding was not found. Therefore, the patient did not undergo regular outpatient examinations, but was followed up at home. After oral administration of antiphlogistic analgetics, the patient's pain was alleviated so well that his activities of daily living were not affected. However, several days prior to consulting us, he became aware of dyspnea on exertion.

#### Symptoms at admission:

Physical examination revealed the following findings: patient state, alert and oriented; respiratory rate, 20 per minute; heart rate, 80 beats per minute and regular; blood pressure, 120/70 mmHg; temperature, 36.7°C; and arterial oxygen saturation, 97% (indoor). Although the breath sounds in the left chest were weak, no thorax deformity or subcutaneous bleeding was seen.

#### Findings of blood examinations:

Elevated levels of transaminases with dominant SGOT levels, elevated levels of gamma GTP, and findings confirming a coagulation disorder (Table 1).

#### Imaging:

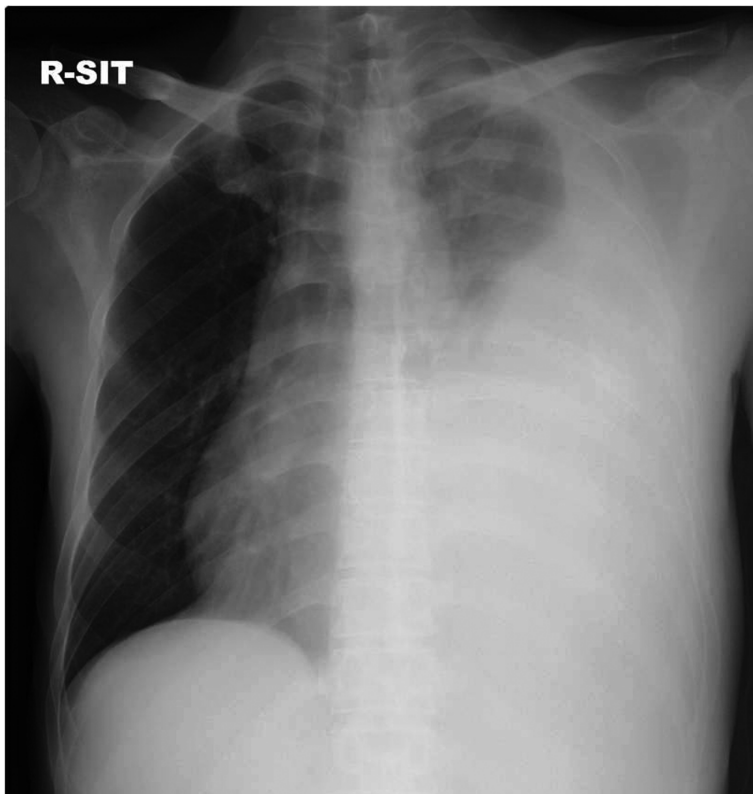
Chest radiograph revealed that the permeability of the left lung field was markedly decreased, with severe pulmonary collapse. The mediastinal shadow was found to be deviated to the right (Fig. 1). Chest contrast enhanced CT showed areas of low absorption with septi inside the thoracic cavity. Mild deviation of the ribs was found at the site of the rib fracture, and areas of absorption higher than that at the periphery were confirmed on the mediastinal side (Fig. 2).

#### Course after admission:

We diagnosed this case as IIa (IR) Ht (left hemothorax accompanying simple fracture type of osseous thoracic injury) according to Thoracic Injury Classification 2008 of the Japanese Association for

**Table 1** Preoperative laboratory values

Parameter	Value	Parameter	Value	Parameter	Value
WBC	4,600/ $\mu$ L	TP	6.2 g/dL	BUN	17 mg/dL
RBC	$358 \times 10^8$ / $\mu$ L	Albumin	2.5 g/dL	Glu	86 mg/dL
Hb	10.5 g/dL	SGOT	33 U/L	Na	141 mEq/L
Hct	33.0%	SGPT	18 U/L	K	4.4 mEq/L
PLT	$16.7 \times 10^4$ / $\mu$ L	LDH	455 U/L	Cl	112 mEq/L
aPTT	28 s	ALP	651 U/L	TBil	1.4 mg/dL
PT	18.2 s	$\gamma$ GTP	135 U/L	Ammonia	54 $\mu$ g/dL
INR	1.39	ChE	83 U/L	CRP	5.97 mg/dL
PT%	54%	Amylase	58 U/L		
Fibrinogen	554	Creatinine	1.1 mg/dL		

**Fig. 1** Chest radiograph showing massive left pleural effusion.

the Surgery of Trauma. [1, 2] A 28-French chest tube placed in the 5th intercostal anterior axillary line drained about 1,000 mL of bloody fluid, and delayed hemothorax was thus diagnosed. Subsequently, 200 mL/hour of bloody discharge was noted. Changes in vital signs and reduced SpO<sub>2</sub> accompanying reexpansion pulmonary edema were absent, thereby allowing follow-up observation. However, because the patient desired to avoid the progression of anemia and blood transfusion during the follow-up observation period, thoracoscopic surgery was performed to confirm the septi and the slightly high-absorbing areas inside them, which were shown on the chest contrast-enhanced CT images.

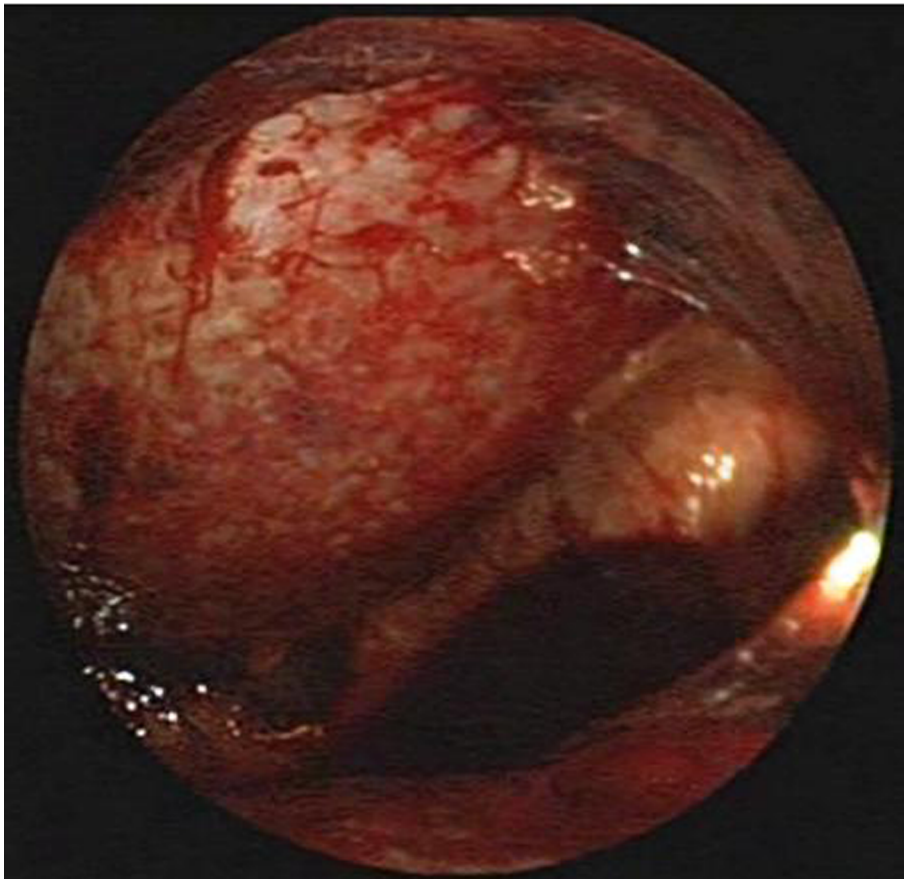
#### Intraoperative findings:

Two transverse skin incisions measuring about 2 fingerbreadths each were made on the 5th intercostal anterior axillary line and the 7th intercostal posterior

axillary line (Two Windows Method) [3] and thoracoscopy was then performed. About 300 mL of bloody pleural effusion remained inside the thorax. The fluid was aspirated and inspected, and it was found that the septi that had been presumed to be multilocular was the parietal pleura, thus confirming a hematoma inside the extrapleural cavity (Fig. 3). The presence of fluid in the parietal pleura was easily confirmed by displacement. A small tear was present at the parietal pleura at the site of the rib fracture, and pressure on the parietal pleura caused fluid to leak to the outer side of the osseous thorax. As a result, communication with the inner side of the thoracic cavity could be confirmed, and the parietal pleura was incised and fenestration surgery performed. The fluid was brownish and was determined to be old blood. After the insides of the thoracic cavity and extrapleural cavity were flushed and hemostasis confirmed, 19-French drainage tubes were placed in both the thoracic cavity and



**Fig. 2** Chest CT scan showing a displaced rib fracture (arrow) and pleural effusion. There is a partition in the thoracic cavity. CT, computed tomography.

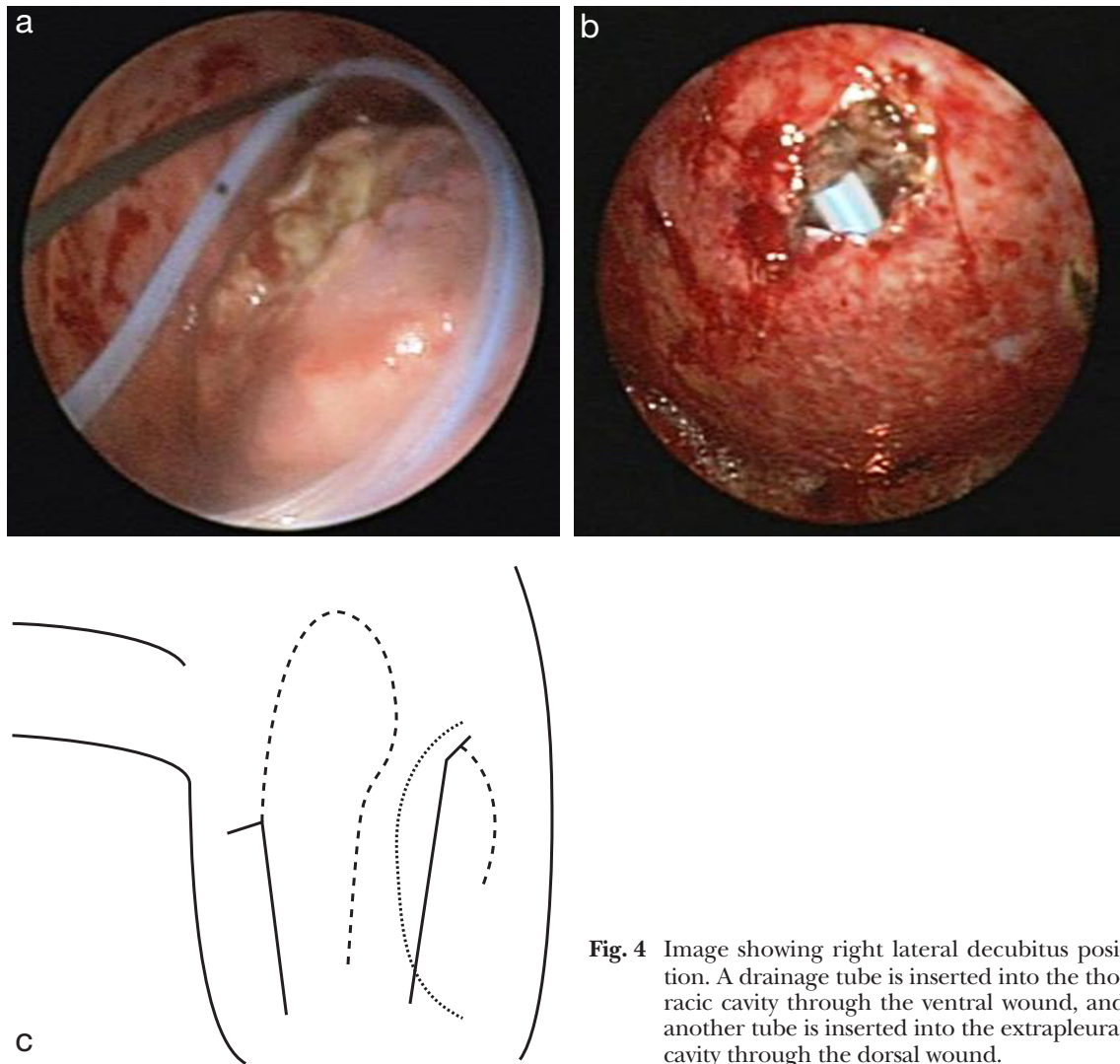


**Fig. 3** Intraoperative view showing extrapleural swelling on the dorsal side of the chest wall.

extrapleural cavity and the surgery was concluded (Fig. 4). The surgical time was 80 minutes and estimated intraoperative blood loss was 4 g.

#### **Postoperative course:**

A chest radiograph taken immediately after surgery showed favorable pulmonary expansion (Fig. 5). The patient's subsequent course was so favorable that he



**Fig. 4** Image showing right lateral decubitus position. A drainage tube is inserted into the thoracic cavity through the ventral wound, and another tube is inserted into the extrapleural cavity through the dorsal wound.

could be discharged on postoperative day 4.

### DISCUSSION

There are many cases of acute-onset hemothorax accompanying blunt chest injury that are caused by injury of the chest wall, such as rib fractures. Many of these cases resolved during follow-up or within several days with conservative treatment procedures such as placement of a drainage tube [4].

Shorr *et al.* reported that delayed hemothorax was found in 2.1% of patients with blunt chest injury [5]; other sources report that the proportion of delayed hemothorax cases among patients with hemothorax ranges from 5.7% to 33% [5, 6].

Although the definition of delayed hemothorax has not been established, Shorr *et al.* have defined it as hemothorax appearing 24 hours or later after an injury [5]. According to Ritter *et al.*, however, when findings of hemothorax are absent on the first examination, the case is considered to be a case of delayed hemothorax even if hemothorax appears only 2 hours later [7].

Rib fracture is the most frequent cause of delayed hemothorax. In fact, it is reported that 92% of the cases of delayed hemothorax accompany multiple or deviated rib fractures [6]. However, delayed hemotho-

rax may also occasionally be seen with sternal fracture, and there have been many reported cases of delayed hemothorax accompanying injuries to the diaphragm [8–10]. Thus, it is necessary to exercise caution with lower rib fracture cases.

As for the treatment, we consider that conservative treatment approaches that are considered standard in cases of acute hemothorax, such as drainage, can be employed for delayed hemothorax as well. However, in rib fractures near the diaphragm, as mentioned above, because the patient may have hemothorax, careful management is necessary and surgical therapy should be considered [8–10]. In our case, we considered the possibility that a hematoma might change to a multilocular form inside the thorax and thus selected thoracoscopic surgery. As a result, a hematoma in the extrapleural cavity and hemothorax could be confirmed. Preoperative CT imaging showed the parietal pleura peeled from the chest wall by the hematoma. The parietal pleura showed extrapleural signs (being smooth at the initial rise and prominent and convex at the thoracic cavity) because of the extrapleural hematoma. Our patient's symptoms might also have been alleviated using conservative therapies such as pleural drainage; however, in the event of an inappropriate chest tube insertion site, it is possible for only the he-





**Fig. 5** Postoperative chest radiograph showing 2 Blake drains in place.

matoma in the extrapleural cavity to be drained or for the parietal pleura to be peeled further from the chest wall at the time of tube insertion. In the latter case, the blunt abrasion may cause iatrogenic re-bleeding; thus, it was necessary to exercise sufficient caution. We believe that the use of a thoracoscope to reduce the invasiveness of the procedure and careful placement of drains are especially effective for cases with septi.

To date, the cause-effect relationship between coagulation abnormalities and extrapleural hemothorax has been reported [11–13]. Extrapleural hemothorax is created when the blood cannot escape into the pleural cavity because the parietal pleura is still intact. However, hemothorax may occur if there exists a laceration caused by chest blunt trauma at the parietal pleura. It should be noted that the amount of bleeding may be increased when the blood can escape into the pleural cavity. At our hospital, we encountered another case of delayed hemothorax accompanying lower rib fracture. Although this case showed no septal wall involvement and was alleviated by drainage and blood transfusion, alcoholic hepatitis and coagulation abnormality were detected. To date, the cause-effect relationship between coagulation abnormalities and delayed hemothorax has not been reported. However, although both patients denied drinking alcohol at the date of the injury, they resumed drinking alcohol from the following day. Thus, it cannot be denied that the peripheral-vessel dilator effect of alcohol prolonged the bleeding. While coagulation function is rarely assessed at the time of thoracic rib fracture, it

will be necessary to instruct patients to restrict alcohol consumption for several days and conduct radiographic follow-up examinations for those being likely to drink.

## CONCLUSIONS

We encountered a case of delayed hemothorax superimposed on extrapleural hematoma after blunt chest injury. When blunt trauma is accompanied by multiple rib fractures or deviation, it is necessary to perform careful follow-up. Where septi are present, the combination of thoracoscopy and carefully placed drains are useful to ensure complete resolution and avoid complications.

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