

Hemothorax after the Intravenous Administration of Tissue Plasminogen Activator in a Patient with Acute Ischemic Stroke and Rib Fractures

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Abstract

A 79-year-old man experienced sudden-onset left hemiparesis and disturbance of consciousness. Diffusion-weighted magnetic resonance imaging showed an acute ischemic stroke in the territory of the right middle cerebral artery. He underwent systemic thrombolysis via the intravenous administration of tissue plasminogen activator (t-PA). Chest radiography and computed tomography performed the following day showed severe hemothorax with atelectasis of the left lung and multiple rib fractures; the initial chest radiogram had revealed rib fractures but we did not recognize them at the time. Conservative treatment with the placement of chest tubes was successful, and the patient recovered without further deterioration. Although systemic thrombolysis with t-PA is an accepted treatment for acute cerebral ischemic stroke, posttreatment intracranial hemorrhage has a negative effect on prognosis. Extracranial bleeding is a rare complication, and our search of the literature found no reports of hemothorax after treatment with t-PA in patients with cerebral ischemic stroke. We have reported a rare case of severe hemothorax after systemic thrombolysis with t-PA. This important complication indicates the need to rule out thoracic trauma with radiography and computed tomography of the chest.

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Key words: cerebral infarction, thrombolysis, tissue plasminogen activator, hemothorax, rib fracture

Introduction

Systemic thrombolysis with tissue plasminogen activator (t-PA) is widely used to treat patients with

cerebral infarction. Although such treatment improves neurological deficits^{1–3}, severe complications, such as bleeding and intracranial hemorrhage, develop in some patients and negatively affects prognosis¹. Extracranial bleeding

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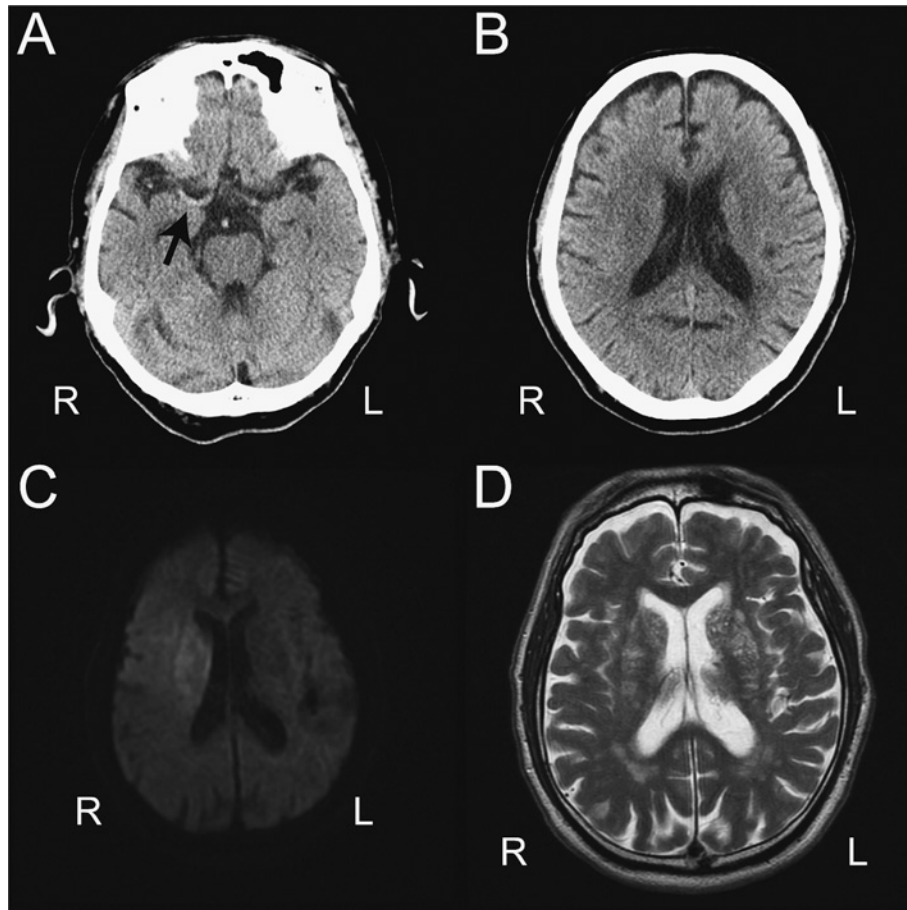


Fig. 1 Imaging studies performed on the day of admission.

A CT scan shows a right hyperdense middle cerebral artery sign (A) but no other abnormalities, such as an early hypodense area. Diffusion-weighted magnetic resonance imaging (C) reveals a hyperintense area in the territory of the right middle cerebral artery. The T2-weighted image (D) demonstrates an old ischemic lesion without evidence of a fresh stroke.

is a rare, life-threatening complication²⁴. We report a rare case of hemothorax with rib fractures after intravenous administration of t-PA to address cerebral infarction.

Case Report

A 79-year-old man lost consciousness and fell. He was admitted to our hospital 40 minutes later. At the time of admission he manifested a disturbance of consciousness with a Glasgow Coma Scale score of 5 (E1V4M4). We noted severe left hemiparesis, and the results of the manual muscle test for both the upper and lower extremities were 1/5. There were no signs of bodily trauma. Because respiration was unstable, oral intubation was performed. Computed tomography (CT) of the brain revealed a right

hyperdense middle cerebral artery (MCA) sign but no bleeding or early hypodense area (**Fig. 1-A**). Electrocardiography showed partial arterial fibrillation. Magnetic resonance imaging demonstrated acute cerebral infarction in the territory of the right MCA (**Fig. 1-B, C**). We did not note rib fractures on a chest radiogram obtained at admission (**Fig. 2-A**).

Cardiogenic embolism was diagnosed, and systemic thrombolysis with t-PA (0.6 mg/kg) was performed according to Japanese guidelines 110 minutes after onset^{5,6}. Although the level of consciousness improved slightly (Glasgow Coma Scale score: 7, E2V4M5) the paresis showed no change. There was no further deterioration of neurological status or vital signs. We also administered edaravone^{7,8} and glycerol starting on

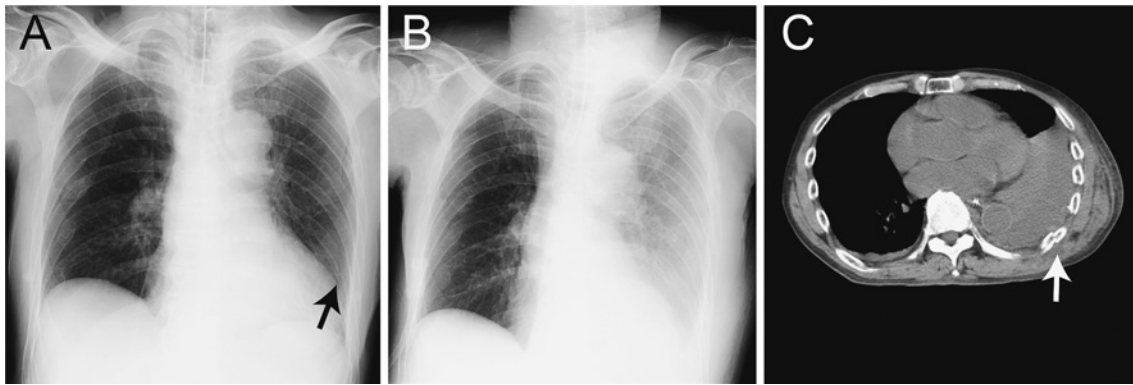


Fig. 2 A chest X-ray film obtained before t-PA was administered shows a fracture of the left 7th rib (**black arrow**, A). A chest X-ray film obtained 1 day after treatment with t-PA reveals a decrease in the permeability of the left lung (B). A CT scan of the chest (C) demonstrates pleural fluid collection on the left side, severe atelectasis of the left inferior lobe of the lung, and multiple rib fractures (**white arrow**).

the day of admission.

A CT scan of the brain obtained at the time of admission showed cerebral infarction in the territory of the right MCA with slightly hemorrhagic transformation. Anticoagulants were not administered. Despite diminished breath sounds in the left lung, respiratory function did not deteriorate. Chest radiography showed a decrease in the permeability of the left lung (**Fig. 2-B**), and a CT scan of the chest (**Fig. 2-C**) revealed pleural fluid collection on the left side with severe atelectasis of the left inferior lobe and multiple rib fractures (**Fig. 2-C**). We reviewed the chest radiogram obtained at the time of admission and now noted several rib fractures on the left side (**Fig. 2-A**). Although oxygenation was adequate with intubation, a chest tube was introduced because of marked fluid collection. Hemothorax was confirmed, and 700 mL of fluid was drained in the course of 1 day. Eight days later left-sided pneumothorax was detected, and another chest tube was placed for 18 days. The patient's condition improved, and 35 days after admission he was transferred to a rehabilitation clinic.

Discussion

Systemic thrombolysis with t-PA is an accepted treatment for acute cerebral ischemic stroke¹⁻⁴. However, among patients treated with t-PA, early cerebral bleeding develops in 18%, and symptomatic

intracranial hemorrhage, defined as any cerebral bleeding with a clinical deterioration of more than 4 points on the National Institutes of Health Stroke Scale, develops in 4%². In Japan the reported incidence of symptomatic intracranial hemorrhage after the administration of t-PA (0.6 mg/kg) is 5.8%⁶. Extracranial bleeding complications after treatment with t-PA has been reported in 3% of patients² and include retroperitoneal, gastrointestinal, or subcutaneous hemorrhage; hematuria; or, in rare instances, aortic dissection^{9,10}; cardiac rupture¹¹; cardiac tamponade¹²; neck hematoma¹³; spinal epidural hematoma¹⁴; and subdural hematoma¹⁵. Extracranial bleeding does not tend to inflict critical damage.

Hemothorax after treatment with t-PA is extremely rare; to our knowledge the only case previously reported was that by Varnholt et al.¹⁶. They administered t-PA to address extensive thrombosis of the femoral and iliac veins and inferior vena cava in a young patient with pleuropneumonia who had predisposing factors for thrombophilia and a congenital deficiency in antithrombin III. However, the patient did not have cerebral infarction despite many underlying disorders. To our knowledge, hemothorax during thrombolysis with t-PA to treat cerebral ischemic stroke has not been previously reported.

Reported rates of rib fracture in cases of hemothorax are 19.6%¹⁷, 52%¹⁸, and 26.8%¹⁹. Hemothorax tends to be due to laceration of the

pleura, the lung, or the chest wall and is usually associated with rib fractures or the rupture of major mediastinal blood vessels or both²⁰⁻²². In our patient, systemic thrombolysis may have exacerbated bleeding from a lung contusion or a minor vascular injury in the pleural space due to rib fracture. The amount of bleeding was so small that we did not detect it on the first chest X-ray film. Delayed hemothorax has been reported in a few cases of blunt thoracic trauma²³⁻²⁵.

In the present case treatment with t-PA was curative but also induced hemothorax. Systemic thrombolysis is effective in patients with acute cerebral ischemic stroke; rib fracture does not constitute a contraindication for treatment with t-PA. However, hemothorax may be life-threatening if the hematoma progresses during the administration of t-PA. Rib fracture is a predictor of severe respiratory disorder due to hemothorax, and attention must be paid to thoracic trauma.

Before performing systemic thrombolysis with t-PA for acute cerebral infarction, we recommend a chest x-ray film be obtained to rule out aortic dissection as an etiologic factor^{9,10,26}. Rib fracture should also be ruled out because it can result in hemothorax, lung contusion, bronchial damage, and injury to the great vessels^{17,27,28}.

In a series reported by Trupka et al.²⁸, intrathoracic injury was missed in 65% of cases when only chest X-ray films were obtained; they recommended that CT scans of the chest should also be obtained. A large percentage of rib fractures are due to motor vehicle accidents, and 30% of patients had fallen¹⁷. In the present case a CT scan of the chest performed after treatment with t-PA revealed several fractures on the ribs on the left side, but we did not note these fractures on the initial chest radiogram. We now think that the patient sustained rib fractures when he fell, but we did not suspect rib fractures because there were no signs of bodily and the patient did not complain of pain because of a disturbance of consciousness. Treatment with t-PA requires immediate intervention and careful observation. Under such conditions we frequently fail to diagnose rib fractures, and neurologists and neurosurgeons, who do not normally deal with rib

fractures, often do not examine chest X-ray films. Furthermore, aortic dissection had received widespread attention, and we took care the chest X-ray but rib fractures are usually unconsidered. Because CT scans are more effective than routine chest X-rays for detecting lung contusion, pneumothorax, hemothorax, and rib fractures²⁹, the risk of complications after t-PA treatment can be reduced by first performing CT to rule out rib fractures and hemothorax.

On the basis of our experiences in the present case we recommend that patients with suspected rib fractures undergo CT of the chest. The presence or progression of hemothorax in patients treated with t-PA must be carefully monitored. Also, the entire body must be checked for signs of trauma before the start of treatment with t-PA because patients with a disturbance of consciousness or hemiparesis due to stroke are susceptible to falls and cannot report pain. Finally, we must remember that extremities with fractures occasionally mimic paralyzed extremities.

Conclusion

We have reported a case of severe hemothorax after systemic thrombolysis with t-PA in a patient with cerebral infarction and rib fractures. Hemothorax is an important potential complication of systemic thrombolysis, and before starting such treatment, thoracic trauma must be ruled out with radiograms or CT scans or both.

Conflict of Interest: The authors declare no conflict of interest associated with this paper.

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