

A Case of Blunt Traumatic Cardiac Tamponade Successfully Treated by Out-of-hospital Pericardial Drainage in a “Doctor-helicopter” Ambulance Staffed by Skilled Emergency Physicians

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We report a 55-year-old man who relapsed into a state of shock in an ambulance before arriving at our critical care center after a fall injury. The diagnosis of cardiac tamponade was made by portable ultrasound, and immediate pericardiocentesis and drainage were performed at the heliport. He was then transported immediately to our hospital with continuous drainage and surgery was performed. After surgery, the patient was transferred to the intensive care unit in stable condition. After undergoing rehabilitation, he made a full recovery and was discharged. This case illustrates that such patients can be treated reliably by pericardial drainage performed by skilled emergency physicians in the field by making use of the “doctor-helicopter” ambulance transportation system, followed by emergency surgery in a critical care center.

Key words: Blunt cardiac trauma, Cardiac tamponade, Doctor-helicopter, Pericardial drainage, Prehospital care

CASE REPORT

The patient was a 55-year-old male hospital employee. While cleaning an external unit of an air-conditioning system at the hospital, he fell from the third floor onto a concrete surface and was injured. Fig. 1 shows the clinical course after injury. He was examined by a doctor at another hospital. The patient's condition at the time of initial examination was Glasgow Coma Scale (GCS) score 3, pulse rate 140 /min, and blood pressure 80 /- mmHg. Following immediate endotracheal intubation and fluid resuscitation, his condition temporarily stabilized and consciousness level improved. Cranial, thoracic, and abdominal computed tomography (CT) led to a diagnosis of small pericardial effusion (Fig. 2) together with hepatic injury, renal injury, and pelvic fracture. Approximately 40 minutes after injury a request was made for him to be transferred to the Critical Care Center at our hospital, because the hospital where he worked was not equipped to deal with rapid changes in condition. A “doctor-helicopter” was accordingly dispatched.

When the doctor-helicopter arrived at the heliport (rendezvous point), approximately 70 minutes after injury, the patient relapsed into a state of shock. Physical findings included jugular venous distension, but there were no other abnormal findings. Focused Assessment with Sonography for Trauma (FAST) was positive only for increased fluid volume in the pericardial space. At this point life-threatening cardiac tamponade was diagnosed, so a decision was made to follow the strategy of immediate pericardial drainage in the ambulance at the heliport. Under ultrasonographic guidance, punc-

ture was performed via the left 5th intercostal space. A guidewire was then used to place a pigtail catheter within the pericardial space. Soon after the aspiration of 50 ml of bloody drainage fluid, the patient's blood pressure rose to 100/53 mmHg, so he was transported to the helicopter and transferred to the Critical Care Center at our hospital. Radio communication was used to instruct the staff there to prepare for emergency

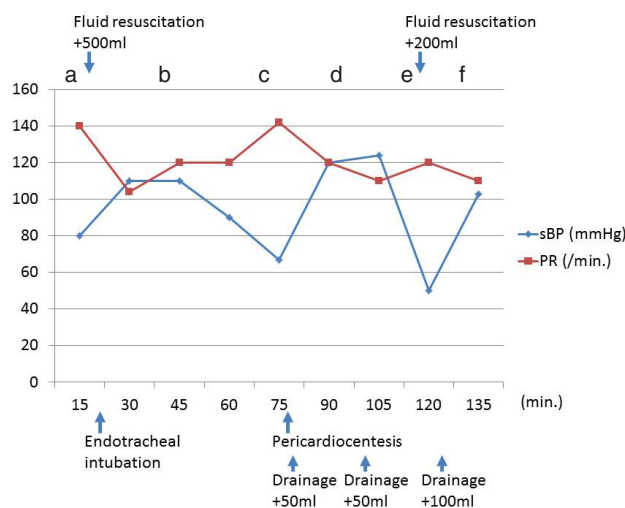


Fig. 1 Clinical course after injury. a. The first medical examination. b. Departure from the previous hospital. c. Arrival of the doctor-helicopter at the heliport (rendezvous point). d. Departure of the doctor-helicopter. e. Arrival at the critical care center. f. Entry to the operating room.



Fig. 2 CT performed at the previous hospital. A small pericardial effusion was seen.

thoracic surgery. During transport, the patient's condition was comparatively stable.

On arrival at the hospital (approximately 110 minutes after injury), the patient's condition was GCS score 11, respiratory rate 29 /min, pulse rate 120 /min, and systolic blood pressure 50 /- mmHg. There were no major changes in physical findings. FAST was negative with the exception of pericardial fluid. The patient had again relapsed into a state of shock, but soon after fluid resuscitation and pericardial aspiration had been performed his blood pressure rose and his pulse stabilized. Blood pressure immediately before entering the operating room was 116/70 mmHg, and at this point total drainage from the pericardial drain was 200 ml.

The approach used for surgery was median sternotomy. At operation, a small hematoma was found in the anterior mediastinum, and the drainage catheter was in place in the pericardium. An incision was made in the pericardium, and the damage was found to comprise a laceration of approximately 1 cm in the right auricle. Suture closure was performed off-pump. A pacing lead was implanted and the operation was concluded.

After surgery, the patient was transferred to the intensive care unit (ICU) in stable condition. His additional injuries resolved with conservative treatment. After undergoing rehabilitation, he made a full recovery and was discharged home on the 27th day of hospitalization.

DISCUSSION

Cardiac tamponade is one of the main causes of death before arriving at a hospital in cases of chest trauma, and its late diagnosis and treatment can be fatal [1].

In many cases, trauma patients with cardiac tamponade have few physical symptoms (such as Beck's triad), and caution is required because the condition is difficult to diagnose on the basis of physical findings alone [2, 3]. FAST is useful for the diagnosis of cardiac tamponade [4, 5], and a simple, portable type of ultrasound device can be used anywhere. In particular, it is regarded as the only type of diagnostic imaging that can be used during transport by a doctor-helicopter.

This was also true in the present case. Depending on the technician's skills, however, it has been pointed out that FAST may result in false negatives owing to insufficient visualization [6]; hence, it must be performed by someone with good technical experience.

Methods of treating cardiac tamponade include puncture, subxiphoid pericardial window, and pericardial window under left antero-lateral thoracotomy. Puncture is not always sufficient to relieve the tamponade in cases of traumatic cardiac tamponade, and, in such cases, pericardial window must be performed as swiftly as possible [7, 8]. In the present case, because centesis resulted in improved circulatory function and blood was subsequently aspirated continuously from the drainage tube, it was judged to be effective and pericardial window was not performed preoperatively.

Possible puncture points for centesis include Larrey's point, the left sternal border, and the left intercostal space with the patient in the left-lateral position [9]. In the present case, the patient also had trauma to other areas at the time the puncture was performed and systemic examination was insufficient, so the sitting position was avoided. In addition, as the procedure was being performed in the narrow confines of the inside of the ambulance, where stretcher manipulation was difficult, ultrasound was used to search for the optimum point in the supine position, and the left 5th intercostal space was selected. The procedure was then performed without complications.

Radio communication from the heliport with the operating room meant that the patient could proceed smoothly to surgery.

We believe that this patient's life was saved because the treatment was performed by a skilled emergency physician, eliminating many potential complications and much wasted time. By "skilled emergency physician," we mean an emergency physician trained in emergency medicine capable performing immediate diagnosis and treatment for severe trauma patients even when in the field.

Our search of the literature has found only a few cases of thoracic penetrating trauma in which prehospital portable ultrasound was used to diagnose traumatic cardiac tamponade and pericardial drainage was

performed to save the patient's life [10]. The present case suggests that pericardial drainage can be reliably performed by skilled emergency physicians even in the out-of-hospital setting.

CONCLUSIONS

We were able to save this blunt-trauma patient's life by diagnosing traumatic cardiac tamponade and performing immediate pericardial drainage using a portable ultrasound device at the heliport prior to transfer to our hospital. Prehospital diagnosis of cardiac tamponade and performance of pericardial drainage by skilled emergency physicians transported to the field by doctor-helicopter ambulance, followed by transportation of the patient to a critical care center, may prevent prehospital deaths from cardiac trauma.

CONFLICTS OF INTEREST

None

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