Emergency management of cardiac tamponade complicating percutaneous coronary intervention using intermittent pericardial drainage and retransfusion during interhospital transport

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Iatrogenic coronary artery perforation during a percutaneous coronary intervention (PCI) is a rare but life-threatening complication frequently leading to progressive cardiac tamponade, acute myocardial infarction, severe arrhythmias, and consecutive cardiogenic shock [1–3]. Even though the reported incidence of coronary artery perforation during PCI is low (0.19–0.93%), consecutive life-threatening cardiac tamponade occurs in 11.3–31% of cases [1–3] and mortality is as high as 7–17% [1]. Although cardiac tamponade oftentimes can be managed only by pericardiocentesis, patients with increasing hemodynamic instability and pending shock require urgent surgical treatment [3]. As only a few hospitals performing PCI provide cardiac surgery backup, these patients frequently require interhospital transport using emergency medical service (EMS).

We report on an 82-year-old female patient with angina pectoris symptoms who underwent elective PCI for angiography control of previously implanted bare-metal stents of the left anterior descending (LAD) coronary artery. During the coronary intervention, positioning of the balloon distal to the previously placed LAD-stent resulted in dissection and rupture of the mid LAD, which was immediately recognized after contrast media leakage became visible. The immediate attempt to cover the rupture by a covered stent failed because of the presence of an extended intima-flap and mechanical resistance in the angulated segment. Within minutes, the patient developed progressive symptoms of cardiogenic shock with decreasing arterial blood pressure from 170/90 to 80/30 mmHg and eventually decreasing heart rate from 61 to 48/min, while respiratory and cognitive functions initially appeared normal (SaO2 98%, Glasgow Coma Scale: 15). Transthoracic echocardiography indicated cardiac tamponade and pericardiocentesis was performed immediately using the substernal puncture approach. Subsequent placement of an intrapericardial catheter and intermittent drainage using a 50 ml syringe through a three-way stopcock resulted in temporary hemodynamic stabilization. An 8 F sheath was placed into the right femoral vein for intermittent autologous retransfusion of evacuated blood (850 ml until EMS arrival). Helicopter EMS was scheduled for interfacility transport from the fluoroscopic suite of the PCI unit to a cardiac surgery unit (distance 30 km) for emergent surgical treatment. Because of lack of space in the helicopter cabin (Eurocopter EC 135), the patient underwent transport by ground ambulance accompanied by a helicopter EMS anesthetist and an interventional cardiologist. Although the patient initially remained conscious and respiratory stable (Glasgow Coma Scale: 14, SaO2 94–98% under supplementation of 5 l/min of oxygen), recurrent episodes of hypotension (lowest blood pressure: 67/32 mmHg) and bradycardia (lowest heart rate: 36/min) occurred because of reaccumulation of pericardial blood requiring frequent manual drainage during transport (total amount of evacuated and retransfused blood 1650 ml) to prevent pending circulatory arrest. Meanwhile, the patient developed non-ST elevation myocardial infarction. The progressively unstable patient was transferred directly to the operating room for emergent cardiac surgery. After emergency median sternotomy, 700 ml of mixed blood was evacuated from the pericardium, resulting in rapid recovery of the right ventricle. However, the left ventricular function remained poor. Inspection of the heart showed two active bleeding sites: (i) active arterial bleeding in the mid LAD territory and (ii) an additional puncture perforation of the right atrial appendage causing massive venous blood loss.
Both perforations were oversewn and the bleeding was controlled. To allow for full recovery of the left ventricular, a skeletonized internal mammary artery graft was prepared and beating heart (off-pump) coronary artery bypass grafting to the mid/distal LAD was performed. The patient was transferred to the cardiac ICU in hemodynamic stability 2.5 h after EMS admission and arrived at the normal ward on postoperative day 4.

The patient recovered well and has a good quality of life at the 1-year follow-up. Written permission to report this case was obtained from the patient.

Reports of management of cardiac tamponade during emergency interfacility transport are scarce and recommendations or guidelines are not available. The reported case highlights that uncommon but life-saving invasive measures may be required to reverse shock and to stabilize hemodynamic conditions during transport. Intermittent pericardial decompression and autologous retransfusion of blood from the pericardial sac have been described previously, but not in patients after iatrogenic coronary rupture requiring EMS transport [4]. During transport, there is always the threat of possible dysfunction of the pericardial catheter because of clotting or displacement. It is advisable that the accompanying team has adequate clinical experience to perform emergency measures including possible repericardiocentesis safely [5,6]. However, as is known from the trauma population, emergency pericardiocentesis may be complicated by high false-negative aspiration rates attributed to the formations of clotted blood in the pericardium, severe iatrogenic myocardial, abdominal, arterial and lung injuries, and considerable data showing improved survival rates with early primary thoracotomy for severe penetrating chest injuries [6]. For monitoring purposes and to guide possible repericardiocentesis, a portable ultrasound device would be useful during transport [6,7]. Appropriate resources for tracheal intubation, chest compression, defibrillation, repericardiocentesis, tube-thoracotomy, vascular access, fluid resuscitation, vasoressor use, and blood transfusion should also be available. Depending on the size of the helicopter cabin, flight distance, and possible difficulties in performing emergency interventions during flight, transport by ground ambulance may be preferred. We recommend early and concise communication with the target hospital so that operating room capacities and staff will be duly prepared when the patient arrives.

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Conflicts of interest
There are no conflicts of interest.

References