

Case Report

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Fatal Acute Cardiac Tamponade after Balloon Angioplasty for Central Venous Stenosis, a Case Report

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Abstract

We report a 40-year-old woman who developed a fatal acute cardiac tamponade after balloon angioplasty for central venous stenosis (CVS) related to hemodialysis. Retrograde and antegrade recanalization followed by balloon angioplasty was carried out through the right-femoral and left internal jugular vein approach. The interventional procedure of recanalization and balloon angioplasty was uneventful with satisfactory angiographic result of the central venous. However, the patient suffered sudden-onset shortness of breath and tachycardia, followed by bradycardia and cardiac arrest, apneic and coma immediately after the procedure. Acute cardiac tamponade was suspected and confirmed by emergency echocardiography. Urgent pericardiocentesis and indwelling catheter placement was performed with 200 ml hemorrhagic pericardial effusion aspirated. However, resuscitation was only successful in relatively stability of blood pressure and heart rate. The patient remained in a coma and was admitted to the Intensive Care Unit (ICU) for further rescue, but still died two days later. Death was determined to be due to cardiac tamponade secondary to perforation of the right atrium by balloon dilation of the stenotic cava-atrial junction. It is an under-reported case of fatal acute cardiac tamponade happened during the balloon angioplasty for CVS in hemodialysis patients.

Keywords: Central venous stenosis (CVS); Hemodialysis; Balloon angioplasty; Cardiac tamponade

Introduction

Central Venous Stenosis (CVS) is a common and serious complication for chronic hemodialysis patients. Percutaneous transluminal balloon angioplasty with or without stent placement is considered the preferred approach to CVS, while surgery procedures are reserved for difficult cases. Available reports regarding safety and efficacy of percutaneous balloon angioplasty have been encouraging with few major complications occurred [1-4]. Here we present a case of death from acute cardiac tamponade following balloon angioplasty to treat CVS in a hemodialysis patient.

Case Report

A 40-year-old woman hemodialysis patient presented with edema of the face, neck, breast and right arm for 6 months, and diagnosed as CVS with ultrasonography. She underwent interventional treatment in July 2012 for symptomatic relief and function restoration of dialysis access. She had previously undergone kidney transplantation for uremia in 2000 and had it removed in 2007. Subsequently she had a history of three failed procedures of arteriovenous fistulae on both arms due to access failure, and two failed central venous catheter insertion in the right subclavian vein and right jugular vein due to infection during the following one-year period of hemodialysis. Hemodialysis was continued with a new arteriovenous fistula on her left arm within the next four years. Therefore her renal failure had required dialysis for a period of 5 years prior to the interventional treatment.

Pre-operative MRV (magnetic resonance venogram) demonstrated severe stenosis of the proximal end of the superior vena cava (Figure 1). Interventional procedure was carried out on July 6, 2012. Heparinization was not given prior to and during the interventional procedure to prevent hemorrhage. Venography through the left internal jugular vein revealed total occlusion of the proximal end of the superior vena cava, namely the cava-atrial junction (Figure 2). The diameter of the distal end of the superior vena cava is about 25 mm. However, the retrograde guide wire could not cross the occluded segment through the right femoral vein approach. Then the antegrade recanalization was

successful from the left internal jugular vein approach. Percutaneous transluminal balloon angioplasty was carried out from the right femoral vein approach without heparinization. Angioplasty was performed twice with two different sized balloons, including an 8 mm×4 cm balloon and a 14 mm×4 cm one (Cook Incorporated, Bloomington USA) respectively (Figure 3). An 8 mm×4 cm balloon was dilated for 3 minutes, after which the stenosis persisted. Then a 14 mm×4 cm balloon was exchanged and dilated for 2 minutes. Post-angioplasty venography showed moderate resolution of the stenosis and there was no obvious suffusion (Figures 4 and 5). Obvious relief in the right arm

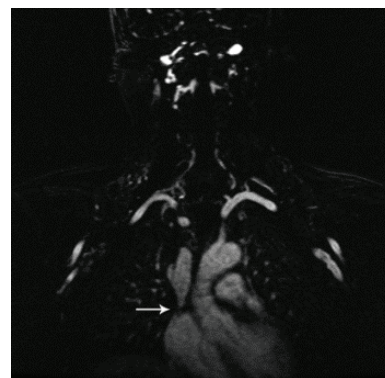


Figure 1: The pre-operative MRV reveals severe stenosis of the proximal end of the superior vena cava, namely the cava-atrial junction (the arrow).

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Received May 10, 2013; Accepted June 01, 2013; Published June 03, 2013

Citation: Huang Q, Gao K, Zhai RY (2013) Fatal Acute Cardiac Tamponade after Balloon Angioplasty for Central Venous Stenosis, a Case Report. J Clin Case Rep 3: 288. doi:10.4172/2165-7920.1000288

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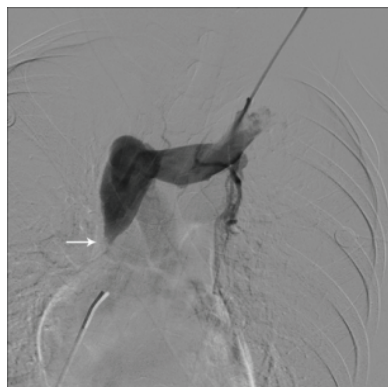


Figure 2: Venography through the left internal jugular vein approach reveals total occlusion of the proximal end of the superior vena cava (the arrow). Continued filling of collateral veins can be seen.

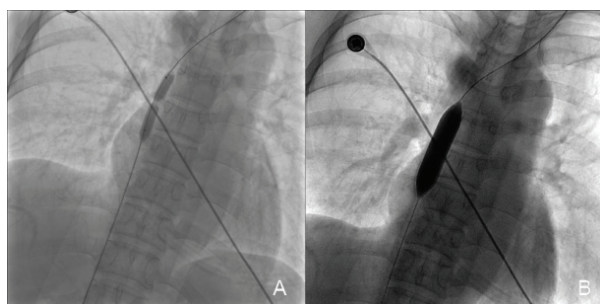


Figure 3: (a) Percutaneous transluminal balloon angioplasty performed with a small sized balloon (8 mm×4 cm) and (b) then a larger one (14 mm×4 cm).

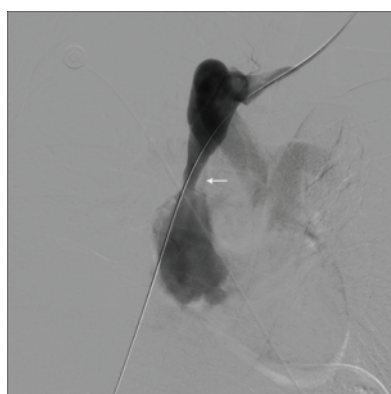


Figure 4: Post angioplasty venography shows moderate resolution of the stenosis (the arrow). No filling of collateral vessels is present after balloon angioplasty. There is no obvious evidence of contrast agent extravasation during the venography.

was observed soon after the balloon angioplasty and further angioplasty with a stent was waived. However, just after the sheath removal from the right femoral vein, the patient suddenly complained of shortness of breath, then collapsed with a tachycardia of 110 beats/min and blood pressure fell to 50/10 mmHg, immediately followed by bradycardia and cardiac arrest, apneic and coma. Cardiopulmonary resuscitation and medical rescue was initiated at once and emergency echocardiography was summoned. Echocardiography detected a moderate pericardial

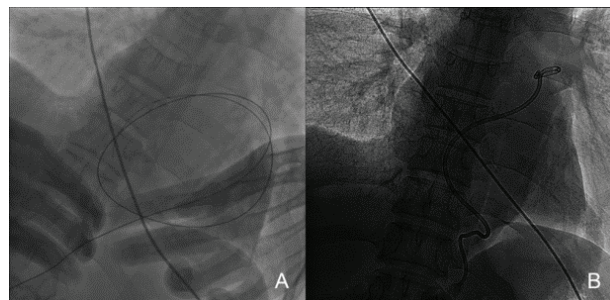


Figure 5: (a) Successful pericardiocentesis was confirmed by characteristic swirl of the guide wire in the pericardial space under fluoroscopy and (b) an indwelling catheter was placed.

effusion and urgent pericardiocentesis with indwelling catheter placement was immediately performed. The hemorrhagic fluid volume aspirated from the pericardial cavity was 200 ml. Defibrillation was conducted and the heart rate was stable at 100-130 bpm with blood pressure of 130/90 mmHg. She was transferred to the Intensive Care Unit (ICU) for further advanced cardiac life support but remained in a coma and was dependant on mechanical ventilation. Multiple organ failure persisted and the patient died two days after admission into the ICU. Post-mortem examination was refused by her family.

Discussion

Acute cardiac tamponade is a sudden life-threatening emergency that can lead to death if not promptly managed. It may occur as a complication of an invasive therapeutic intervention or is the result of trauma associated with rupture of the heart or the intrapericardial vessel [5].

It is an under-reported case of acute cardiac tamponade complicating balloon angioplasty to treat CVS in hemodialysis patients. Most cases of iatrogenic cardiac tamponade reported in the literature are associated with central venous catheters or percutaneous transluminal coronary angioplasty and carries a high mortality rate [6-9]. Theoretically, cardiac tamponade can complicate any interventional procedures during which catheters or balloon dilation was performed. However, there is an only limited similar case report in the literature. Two cases of cardiac tamponade complicating central venous interventions are described by Forauer et al., with one during the balloon angioplasty followed by stent placement in malignant superior vena cava stenosis, and the other caused by failed recanalization of hemodialysis related superior vena cava stenosis using guide wire and catheter [10]. Other case reports of cardiac tamponade are all occurred during or following stent placement in malignant superior vena caval obstruction [11-15].

Unfortunately, the mechanism of superior vena cava perforation leading to cardiac tamponade cannot be described precisely in this case, because no autopsy result was achieved. The following pathogenesis and fatal result of our case is analyzed and summarized by all the clinicians participating in the diagnosis, treatment and rescue of the patient. Firstly, the etiology of the stricture may be infection-induced, since the patient had history of failed central venous catheter insertion due to infection. Secondly, failed recanalization of the occluded caval-atrial junction from the right femoral vein approach was suspected to be one factor, since the guide wire could have entered the extra vascular space during the interventional manipulation, but there was no evidence shown by the venography. Thirdly, further dilation using a larger-sized balloon after successful recanalization was presumed

to be another factor, which could cause laceration in the cava-atrial junction or the right atrium. The size of balloon was chosen according to the diameter of the stenotic segment and the normal superior vena cava, but there was no consistent standard in the literature. Fourthly, operator experience in this case is also part of the reason. Performing balloon dilation with a pressure pump instead of manually may help to prevent the fatal complication, since the real-time inflation pressure can be monitored. Fifthly, whether a stent can be helpful or not is controversy since several cases of cardiac tamponade following the stent insertion have been reported [12-15]. A covered stent to seal the perforation may be helpful if possible. But it was unrealistic during the urgent cardiopulmonary resuscitation in this case.

Above all, preexistent comorbidities associated with long-term hemodialysis may be one important reason of death in this case. 200 ml pericardial effusion is not an extremely large amount but yet can be fatal. In fact, it has been illustrated that an accumulation of as little as 100 ml of transudate, exudate, or blood may lead to symptomatic and sometimes catastrophic pericardial effusion, depending on how rapidly the fluid accumulates [10].

In conclusion, cardiac tamponade secondary to balloon angioplasty is a potentially fatal complication of percutaneous transluminal central venous intervention. Interventional Radiologists should be aware of the potential risk of cardiac tamponade in the interventional procedures in hemodialysis patients.

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