

Bedside Echocardiographically Guided Pericardiocentesis for Cardiac Tamponade after Coronary Artery Injury Secondary to Percutaneous Coronary Intervention: A Case Report and Descriptive Technique

Graham Brant-Zawadzki*, Marina Trilesskaya and Arun Nagdev

Alameda Health System-Highland General Hospital, USA

Abstract

Given over 2.64 million total percutaneous coronary interventions performed in the United States, and that acute cardiac tamponade is one of the most common complications of such percutaneous coronary interventions, clinicians should be familiar with diagnosing impending pericardial tamponade, and a simple and safe bedside technique for drainage. We describe a technique for echocardiographically guided rescue pericardiocentesis in the setting of acute tamponade to demonstrate the efficacy and safety of this technique for pericardial drainage with reduced complication risk as compared to a landmark-based approach. A case of a 52-year-old male was brought to the Emergency Department after a witnessed cardiac arrest. He underwent cardiac catheterization and percutaneous coronary stent implantation. Thirty minutes after stenting, the patient developed signs of cardiac tamponade, and point-of-care echocardiogram confirmed a pericardial effusion. An in-plane ultrasound-guided pericardiocentesis was successfully performed by the junior house-staff under direct attending supervision. Serial echocardiograms demonstrated preserved left ventricular systolic function without new effusion. The patient remained hemodynamically stable for 48 hrs following the procedure at which time the pericardial catheter was removed. Ultrasound image guided pericardiocentesis is a rapid and safe technique for pericardial drainage with reduced complication risk as compared to a landmark-based approach.

Keywords: Pericardiocentesis; Echocardiography; Ultrasound guided; Tamponade; Pericardial effusion; Percutaneous coronary intervention

Introduction

In 2007, over one million cardiac catheterizations and 2.64 million total percutaneous coronary interventions (PCI) were performed in the USA [1]. Immediate life threatening complications that manifest as post-procedural hypotension are rare and may include hematoma, retroperitoneal hemorrhage, stent thrombosis and cardiac tamponade. Acute cardiac tamponade is one of the most common hypotensive complications and, though the total rate over all percutaneous coronary interventions is difficult to assess, data suggests tamponade may be seen in up to 0.6% of all PCI [2,3]. Echocardiographically Guided Pericardiocentesis (EGP) has been shown to be both safe and effective therapy for emergent rescue in the setting of tamponade [4]. Novice echocardiographers can both identify and successfully perform pericardiocentesis at the bedside safely with an in-plane technique which allows for needle visualization [5-7]. Clinicians caring for patients after cardiac catheterization and coronary interventions should be aware of the most common post-procedural causes of hypotension and be facile in Point-Of-Care (POC) echocardiographic evaluation of the unstable patient. Although coagulopathy is considered a relative contraindication to pericardiocentesis, pre-procedure anticoagulation reversal may not be feasible due to hemodynamic instability, and a simplified method that allows for needle guidance into the pericardial space should be a part of the armamentarium of the critical care physician. We present a case of successful bedside rescue pericardiocentesis after cardiac tamponade secondary to coronary guidewire arterial perforation in an anticoagulated patient.

Case Report

A 52-year-old man was brought into the emergency department (ED) after experiencing a witnessed cardiac arrest. Cardiopulmonary resuscitation (CPR) was initiated by a bystander. Standard American cardiac life support (ACLS) protocol was continued in the ED resulting in return of spontaneous circulation (ROSC). An electrocardiogram

(ECG) post-ROSC was notable for inferior ST-elevations with reciprocal changes in the anterior precordial leads (Figure 1). Hypothermia protocol was initiated and the patient was taken to cardiac catheterization laboratory where 100% occlusion of the obtuse marginal artery was noted, and percutaneous coronary intervention with stent implantation was performed. Approximately thirty minutes after arrival to the intensive care unit (ICU), the patient developed hypotension (72/51 mmHg) and tachycardia, refractory to fluid resuscitation and dopamine. Cardiac tamponade was suspected, and point-of-care (POC) echocardiogram was performed by a junior resident. A small to moderate pericardial effusion was noted lateral to the left ventricle and was confirmed by the attending interventional cardiologist (Figure 2). The effusion was thought to be secondary to wire perforation in the setting of recent anticoagulation with bivalirudin, compounded by ongoing hypothermia-protocol.

Given the patient's hemodynamic compromise refractory to medical therapy, an in-plane ultrasound-guided pericardiocentesis was performed by the house-staff under direct attending supervision [7]. A low frequency curvilinear transducer (5-2 MHz SonoSite™ M-Turbo, Bothell, WA) was used for the pericardial drainage instead of a more commonly used phased-array transducer in order to better visualize the needle as it entered the pericardial space. Our preference is to use the curvilinear transducer, but either probe can be used as

***Corresponding author:** Graham Brant-Zawadzki, Alameda Health System-Highland General Hospital, USA, Tel: (510) 437-4564; Fax: (510) 437-8322; E-mail: graham.brant-zawadzki@alamedahealthsystem.org

Received January 29, 2016; **Accepted** March 09, 2016; **Published** March 13, 2016

Citation: Brant-Zawadzki G, Trilesskaya M, Nagdev A (2016) Bedside Echocardiographically Guided Pericardiocentesis for Cardiac Tamponade after Coronary Artery Injury Secondary to Percutaneous Coronary Intervention: A Case Report and Descriptive Technique. J Clin Case Rep 6: 740. doi:10.4172/2165-7920.1000740

Copyright: © 2016 Brant-Zawadzki G, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

long as the clinician is able to clearly visualize the needle tip as it enters the pericardial space. Visualization of the effusion in the pericardial sac was accomplished in a view that best delineated the pericardial effusion (modified apical view from the anterior chest), and insertion of an over-wire catheter into the pericardial space via Seldinger technique under in-plane ultrasound guidance. Once catheter placement was



Figure 1: The patient's Emergency Department ECG. Pre-catheterization procedures.

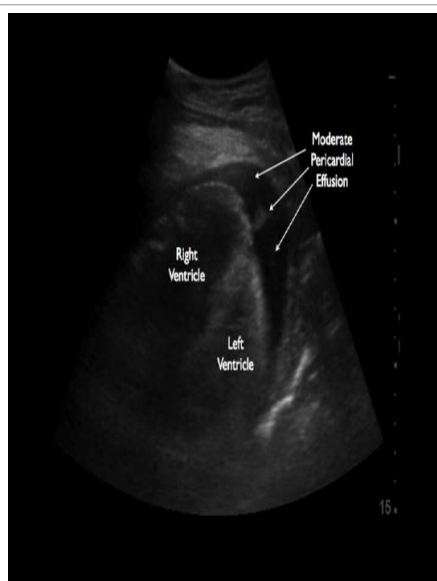


Figure 2: Modified four chamber view. This view shows clear visualization of the small to moderate sized pericardial effusion noted between the apex of the right and left ventricles.



Figure 3: Technique: After needle insertion and aspiration of blood, the guide wire is placed into the pericardial space. Ultrasound visualization allows for direct confirmation of entry into the pericardial space / effusion.

confirmed on ultrasound (Figure 3), 350 milliliters (mL) of frank blood were immediately evacuated from the pericardial space followed by resolution of tachycardia and a noted rise in mean arterial blood pressure (MAP) from 58 mmHg to 101 mmHg. Given the patient's international normalized ratio (INR) of 3.6, which was thought to be related to hypothermia, frank blood continued to fill the pericardial space following initial aspiration and while awaiting fresh frozen plasma (FFP) to correct the coagulopathy. Over the course of one hour, the catheter drained an additional 500 mL of frank blood from the pericardial space, which was immediately auto-transfused into the patient's femoral vein through previously placed central venous access. In the setting of ongoing bleeding, the patient was taken for a repeat coronary angiogram. This showed no obvious contrast extravasation, dissection or perforation and no further intervention was performed. It was felt that the patient's pericardial effusion was the result of a micro-perforation, which failed to resolve spontaneously due to significant coagulopathy. Hypothermia protocol was discontinued, the pericardial drain was maintained overnight, and serial POC echocardiographic evaluations were performed while the patient was resuscitated with a total of 4 units of packed red blood cells and 4 units of fresh frozen plasma. A formal echocardiogram the following morning demonstrated minimal effusion and preserved left ventricular systolic function. The patient remained hemodynamically stable on the ventilator for 48hrs following the procedure at which time the pericardial catheter was removed. Despite clinical stabilization, the patient's neurologic status failed to improve beyond basic brainstem function. In accordance with the family's understanding of the patient's wishes, supportive care was withdrawn and the patient expired one week after presentation.

Conclusion

Acute cardiac tamponade is one of the most common complications of percutaneous coronary intervention that may present

with hypotension. The number of coronary interventions and other procedures with a risk of inadvertent guide-wire perforation of the heart such as pacemaker insertions, pulmonary angiograms, and even central line placement is high in the USA. Clinicians must be familiar with diagnosing impending pericardial tamponade, and a simple and safe bedside technique for drainage. In the hypotensive, post-cardiac procedure patient, bedside echocardiography should be a first-line screening tool to be employed alongside checking catheter insertion site for hematoma and 12-lead EKG. In the case of tamponade, echocardiographically guided rescue pericardiocentesis is an effective and safe technique for pericardial drainage with reduced complication risk as compared to a landmark-based approach [4]. We recommend that any provider caring for post-cardiac intervention patients be facile with the echocardiographic diagnosis of pericardial effusion and a simple ultrasound-guided approach for drainage.

References

1. Hall MJ, DeFrances CJ, Williams SN (2010) M.S. National Hospital Discharge Survey: Summary. Department of Health Care Statistics, Center for Disease Control, Hyattsville, USA Department Of Health & Human Services.
2. Tsang TSM, Freeman WK, Marion B "(1998) Rescue Echocardiographically Guided Pericardiocentesis for Cardiac Perforation Complicating Catheter-based Procedures." *J Am Coll Cardiol* 5: 1345-1350.
3. Tavakol M, Ashraf S, Brener SJ (2012) Risks and complications of coronary angiography: a comprehensive review. *Glob J Health Sci* 4: 65-93.
4. Tsang TSM (2002) "Consecutive 1127 Therapeutic Echocardiographically Guided Pericardiocenteses: Clinical Profile, Practice Patterns, and Outcomes Spanning 21 Years." *May Clinic Proceedings* 77: 429-436.
5. Mandavia Diku P, Richard J, Hoffner (2001) "Bedside Echocardiography by Emergency Physicians." *Ann Emer Med* 4: 377-382.
6. Nagdev A, Stone MB (2011) Point-of-care ultrasound evaluation of pericardial effusions: does this patient have cardiac tamponade? *Resuscitation* 82: 671-673.
7. Nagdev A, Mantuani D (2013) A novel in-plane technique for ultrasound-guided pericardiocentesis. *Am J Emerg Med* 31: 1424.