



Case Report

Transesophageal echocardiography identification of aortic dissection during cardiac arrest and cessation of ECMO initiation



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ABSTRACT

Cardiac arrest is a challenging clinical presentation that emergency medicine providers often encounter. Aortic dissection is an uncommon etiology in all-comers presenting in cardiac arrest. The use of bedside point of care echocardiography to aid in resuscitative efforts is expanding, particularly with the increasing use of transesophageal echocardiography (TEE) by emergency medicine providers. Additionally, emergency department initiation of extracorporeal membrane oxygenation (ECMO) is a relatively newer development in emergency department practice. We report the case of a 64-year old male presenting to the emergency department in cardiac arrest with TEE identification of aortic dissection as the etiology resulting in discontinuation of ECMO initiation attempts.

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1. Case report

A 64-year-old male with no known past medical history presented to the emergency department (ED) in cardiac arrest. Per emergency medical services report, the patient had a witnessed cardiac arrest while at work with immediate bystander CPR and automated external defibrillator (AED) placement with an initial rhythm of ventricular tachycardia. Prior to arrival, the patient received one AED defibrillation, four 1 mg epinephrine boluses, and was loaded with amiodarone. Return of spontaneous circulation (ROSC) was achieved after approximately 20 min. Approximately 5 min prior to arrival to the emergency department, the patient re-arrested and had ongoing CPR on ED arrival. Patient arrived with a left tibial interosseous cannula and supraglottic airway device in place.

Based on our institution's multidisciplinary protocol, the patient met inclusion criteria for initiation of ED extracorporeal membrane oxygenation (ECMO), and therefore a multidisciplinary ECMO team evaluation was initiated. Due to poor ventilation with the supraglottic device, the patient was intubated endotracheally for definitive airway management. Emergency department, anesthesia, and cardiothoracic surgery providers established femoral venous and arterial access to facilitate cannulation for initiation of ECMO. A mechanical CPR device was utilized for ongoing compressions. His cardiac rhythm progressed from initial asystole to bradycardic pulseless electrical activity.

During resuscitative efforts and due to ongoing compressions with the use of a mechanical CPR device, transthoracic echocardiography (TTE) imaging windows were limited and thus transesophageal echocardiography (TEE) was utilized to guide resuscitation, assess adequacy of compressions, and minimize pulse check times. A midesophageal long axis view was the primary imaging window for assessment of cardiac activity and compression adequacy. On cross-sectional view of the aorta in an attempt to confirm arterial guide-wire placement, it was noted that there was a large aortic dissection flap (Video 1). This was further visualized in a midesophageal aortic valve long-axis view with the dissection appearing to originate near the aortic root (Video 2).

Due to the presence of a large aortic dissection with ongoing asystole, it was determined that further ECMO initiation attempts and resuscitative efforts were futile. A conversation with the patient's family was held and resuscitative efforts were ceased with family present at bedside and the patient was declared deceased.

2. Discussion

Etiologies of cardiac arrest include acute coronary syndrome, respiratory failure, metabolic derangements, among many others. The incidence of aortic pathology, specifically dissection as the etiology of arrest is unknown, however, several studies have attempted to quantify aortic pathology contribution. Meron et al. demonstrated an overall incidence of 2.3% for aortic pathologies with only 1% ($n = 19$) involving dissection in a retrospective study of greater than 1900 patients in cardiac arrest [1]. Chen et al. found an overall incidence of 0.1% (1/982), making aortic dissection an uncommon cardiac arrest presentation [2].

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Standard TTE point-of-care views utilized during cardiac arrest in the emergency department often include parasternal long axis, parasternal short axis, apical 4 chamber, and subcostal imaging windows. These imaging windows do not adequately visualize the aortic root, ascending aorta, or descending aorta. Additionally, recent studies have demonstrated that use of intra-arrest TTE lengthens pulse check times [3].

Emergency medicine societal guidelines have been published regarding the use of TEE in the emergency department for resuscitative guidance during cardiac arrest. The recommendations utilize a 3-view approach including midesophageal 4-chamber, midesophageal long axis, and transgastric short axis [4,5]. These TEE intra-arrest views do not adequately image the aorta for potential pathology. It has been noted, however, that aortic visualization with TEE has been useful to aid in vascular cannulation during ECMO [6].

Our case demonstrates the use of intra-arrest TEE during attempted ECMO initiation and the subsequent discovery of aortic dissection as the etiology of arrest allowing for cessation of resuscitation. Although as denoted above, aortic pathology is uncommon as the etiology of cardiac arrest, it is easily identifiable with the use of TEE using both a descending aortic short axis view and a midesophageal aortic valve focused long axis view.

Aside from the identification of arrest etiology, diagnosing aortic dissection had several other additional useful purposes. Although there has been a case report regarding ECMO initiation followed by aortic dissection repair, outcome data is lacking [7]. Given initiation of ECMO is a resource heavy endeavor, identification of preclusion pathology allows for consideration of early termination. Secondarily, earlier termination reduces the risk to clinicians attempting vascular access from needlesticks

and body fluid exposures [8]. Finally, in identifying an etiology of arrest, this allowed for an open discussion with the patient's family and allowed for more complete closure once resuscitation was terminated.

The addition of aortic views to TEE during cardiac arrest may occasionally provide diagnostic information to guide resuscitation efforts and should be considered in emergency department providers who are already using TEE to guide resuscitation.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ajem.2019.02.039>.

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