

From 'Port' to 'Life Support'-A Case Report and Review of Cardiac Tamponade during Port Placement

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Article Information

Received date: Apr 14, 2017

Accepted date: Apr 27, 2017

Published date: May 02, 2017

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Abstract

A 6 month old patient with multiple congenital anomalies and adrenal neuroblastoma with hepatic metastasis underwent subclavian port placement under general anesthesia. During routine placement of the device into the vessel the patient developed acute hypotension progressing to bradycardic arrest due to cardiac tamponade. Hemodynamic compromise resolved immediately after pericardiocentesis and placement of a pericardial drain. This rare complication of central access placement should be considered with hemodynamic changes during these procedures.

Introduction

A 6 month old female presented for bone marrow and hepatic biopsy and port placement. Her history included adrenal neuroblastoma with hepatic lesions and congenital abnormalities including left pulmonary artery stenosis. On the date of surgery she arrived to the operating room with a peripheral IV in place and had an uneventful induction of general anesthesia with endotracheal tube placement. The right subclavian vein was accessed by the surgeon using surface landmarks. A wire was advanced into the vessel under fluoroscopic guidance and a 7F dilator with peel away AngioDynamics 6.6F Mini Smart Port sheath was advanced over the wire. Position of catheter tip was again confirmed within the right atrium. During incision closure, the patient developed a sudden decrease in end-tidal CO₂ and bradycardia which was treated with 1 mcg/kg of epinephrine. Breath sounds were confirmed to be bilateral and fluoroscopy revealed no pneumothorax or hemothorax. Cardiac echosonographers were called to obtain an emergent transthoracic echocardiogram which initially showed a small pericardial effusion. The patient required repeated doses of epinephrine to maintain an adequate mean arterial pressure, and over several minutes the effusion progressed to right atrial and ventricular tamponade. At this point the patient became progressively hypotensive with loss of palpable pulses and CPR was initiated. Soon after the beginning of resuscitation the interventional cardiologist arrived and placed a percutaneous pericardial drain under ultrasound guidance with approximately 60mL of blood return and near immediate restoration of cardiac function. The drain was left in place and the patient was admitted to the intensive care unit where she remained stable and was ultimately discharged to home on post-operative day 11.

Discussion

In this case, central venous catheter placement resulted in acute cardiac tamponade and arrest. Central access is commonly obtained in pediatric patients for perioperative and non-operative considerations, but the procedure carries potentially fatal risks both at the time of insertion and in the days afterward. Among reported fatal and life-threatening complications from central venous catheters in pediatric patients, cardiac tamponade was the most frequently cited cause of death overall and second only to hemothorax as a cause of death in the first 24 hours after insertion [1]. Mortality from tamponade in a large pediatric review was reported to be 47% [2] but figures from 0% -100% in adults and children have also been cited [1]. In the literature, a greater emphasis has been placed on tamponade in children that develops hours or days after access placement. While over 60 pediatric cases of tamponade after catheter placement have been reported [2] and the overall incidence was recently reported to be 1.3% [3], the incidence of acute tamponade at the time of placement is unknown. The largest collection of pediatric tamponade cases related to catheter insertion reported a median time from insertion to diagnosis of 3.0 days with a range of 0.2-37 days with no report of tamponade at the time of insertion [2].

Acute tamponade immediately after placement is likely due to cardiac or caval perforation by the guide wire, dilator, or catheter. Recommendations for prevention of immediate perforation include

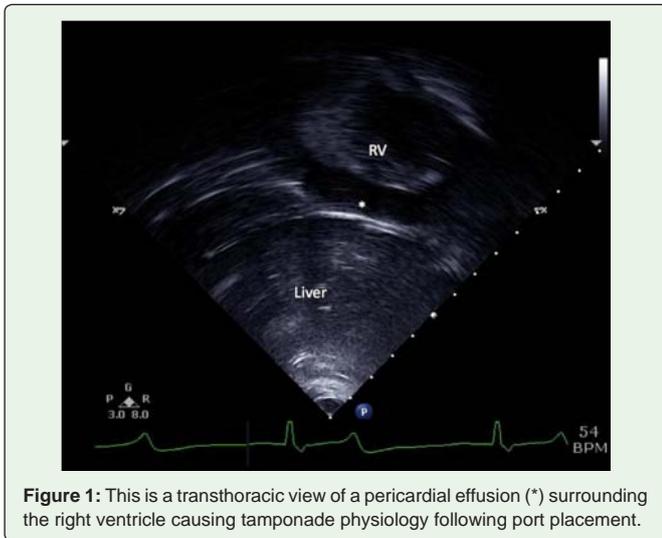


Figure 1: This is a transthoracic view of a pericardial effusion (*) surrounding the right ventricle causing tamponade physiology following port placement.

using flexible catheters of the appropriate size, not advancing the guide wire farther than necessary, and avoiding beveled catheter tips [4], but no studies have identified risk factors for acute perforation during catheter placement in children (Figure 1).

Early signs of tamponade may include apnea, hypotension, decreasing pulse pressure, or distant heart sounds. Bradycardia may be more common than tachycardia in children [2]. Other suggestive findings include radiographic evidence of enlarged heart border, catheter malposition by contrast injection or low-voltage ECG. A finding of pericardial effusion by echocardiography with a suspicion

for tamponade is diagnostic. In some cases sudden cardiac arrest is the first and only sign of acute tamponade [4]. A high index of suspicion is required in the operating room as some signs and symptoms present in an awake patient will be obscured under general anesthesia.

Once tamponade is suspected, rapid confirmation and treatment is vital to manage cardiovascular collapse. Management consists of immediate discontinuation of any infusions through the catheter, inotropic support and pericardiocentesis [1,4]. In one review, mortality of patients who received prompt pericardiocentesis was 8% compared to 75% who did not receive pericardiocentesis [2]. When pericardial draining does not result in improvement then sternotomy and open surgical repair may be required. Recurrence of effusion can occur, and ongoing observation for several days to monitor for recurrent hemopericardium with placement of a pericardial drain should be considered.

References

1. Askegard-Giesmann JR, Caniano DA, Kenney BD. Rare but serious complications of central line insertion. *Semin Pediatr Surg.* 2009; 18: 73-83.
2. Nowlen TT, Geoffrey LR, Gregory LJ, Deborah JT, Thomas AV. Pericardial effusion and tamponade in infants with central catheters. *Pediatrics.* 2002; 110: 137-142.
3. Weil BR, Ladd AP, Yoder K. Pericardial effusion and cardiac tamponade associated with central venous catheters in children: an uncommon but serious and treatable condition. *J Pediatr Surg.* 2010; 45: 1687-1692.
4. Agarwal KC, Khan MA, Falla A, Amato JJ. Cardiac perforation from central venous catheters: survival after cardiac tamponade in an infant. *Pediatrics.* 1984; 73: 333-338.