

Cardiovascular collapse with attempted pericardial drain withdrawal

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ABSTRACT

Cardiac tamponade is a rare but serious emergency condition in the pediatric population. As treatment, a pericardial drain is often placed to evacuate the fluid. We present a case of a 4-year-old girl with cardiac tamponade secondary to renal failure. After the tamponade resolved, she suffered cardiovascular collapse upon attempted drain withdrawal. This case highlights an unusual cause for cardiovascular collapse, which occurred on blind removal of a pericardial drain.

Keywords: Cardiac tamponade, pericardial drain, pericarditis

INTRODUCTION

Cardiac tamponade is an excess collection of fluid in the pericardial sac that leads to hemodynamic compromise. It is a rare but serious emergency condition in the pediatric population. Children are less tolerant of the resulted decreased stroke volume making the elimination of fluid even more urgent. In the pediatric population, cardiac tamponade can occur in patients who have undergone cardiac interventions and also in noncardiac patients with infections, malignancies, collagen vascular disorders, trauma, hypothyroidism, uremia, or rheumatic disease.^[1,2] A pericardial drain is often placed to evacuate the fluid. Once the output is minimal, it is blindly pulled. We present a case of cardiac tamponade in a pediatric patient requiring pericardial drain placement. This case is novel because attempted removal of the drain resulted in complete cardiovascular collapse. There has not been a similar complication reported in the literature, particularly in a pediatric patient.

CASE HISTORY

A 4-year-old girl with a complicated medical history of developmental delay, myelomeningocele,

hydrocephalus, neurogenic bladder, and recurrent urinary tract infections had a 2-month hospital stay for urosepsis and hemolytic uremic syndrome. This led to chronic renal failure. She was discharged on peritoneal dialysis. She was stable at home for approximately 2 months when she presented to an outside emergency department for seizure-like activity and fever. She was found to be in distress, tachycardic, and tachypneic, with a distended abdomen, but maintaining normal oxygen saturations on room air. She was given lorazepam, fosphenytoin, and antibiotics and transferred to our facility. On arrival, a chest x-ray was performed that showed an enlarged cardiac silhouette suspicious for tamponade. For that reason, a transthoracic echocardiogram (TTE) was obtained. The TTE showed a moderate circumferential pericardial effusion with diastolic right atrial collapse suggestive of tamponade physiology. The patient was urgently taken to the catheterization laboratory. She remained hemodynamically stable during intravenous induction and endotracheal intubation. A 6-French pigtail catheter was placed in the pericardial space under ultrasound and fluoroscopic guidance and secured in place with a self-adhesive securement device specifically designed for percutaneous drainage catheters; 220 ml of

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serosanguineous fluid was drained. The patient stabilized and after 2 days, the pericardial drainage was minimal and a decision was made to discontinue the drain. The cardiologist attempted removal at the patient's bedside. The girl became unresponsive, had a decreased respiratory rate, and bradycardia. Chest compressions were initiated and the patient was ventilated via bag mask. Shortly thereafter, the patient started breathing spontaneously and had a palpable pulse. A bedside chest x-ray was performed [Figure 1] in which the pigtail catheter appeared in the pericardial space but the exact orientation was unclear. The patient was then transferred to the operating room (OR) for TTE-guided withdrawal of the drain. A TTE was performed under general anesthesia showing minimal effusion but the exact location could not be determined. With the code cart available and the team prepared, another attempt to blindly remove the catheter was performed in the OR. The patient became profoundly hypotensive and bradycardic. External cardiac compressions were initiated. A 0.35 flex guidewire was passed into the catheter and the wire and catheter were advanced back into the chest several centimeters. The patient very quickly stabilized hemodynamically. The team felt the drain must be encircling a major vessel and decided to remove the catheter under direct visualization via sternotomy by a pediatric cardiothoracic surgeon. The catheter was found to course anteriorly and superiorly over the pulmonary artery and aorta and posteriorly and inferiorly under the heart. The pigtail portion was adjacent to the atrial appendage. Traction on the catheter resulted in complete occlusion of main pulmonary artery and severe reduction in pulmonary blood flow. An abrupt fall in end-tidal carbon dioxide was also noted. The drain was surgically removed without further complication. The patient recovered from this episode in the pediatric intensive care unit.

DISCUSSION

Complications from pericardial drains are fortunately rare. Haponiuk and colleagues^[3] published a retrospective analysis of a single-center experience of 15 patients, ages 2 weeks to 18 years, with no reported complications. These drains were placed by a minimally invasive transxiphoid approach after echo-confirmed diagnosis.^[3] The incidence of major complications related to pericardial drains placed in an experienced center is estimated between 1.2% and 1.6%.^[4]

After a thorough literature review, four cases of pericardial drain complications were identified. There were no case reports of any drain complications in a pediatric patient. Johnson and Osborn^[5] reported a case in a 25-year-old patient who had a drain placed for tamponade caused by trauma. The drain broke on

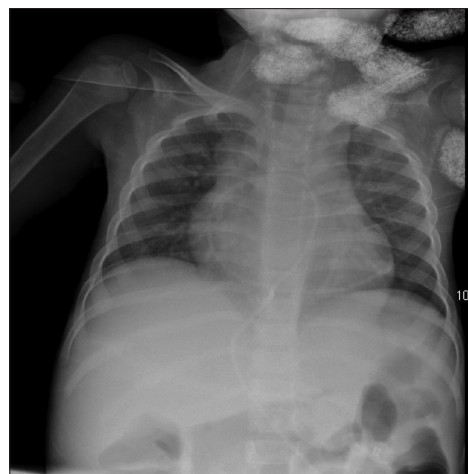


Figure 1: Chest x-ray of patient performed after initial cardiovascular collapse from attempted withdrawal on the medical floor

attempting withdrawal. The remainder of the catheter was surgically retrieved.^[5] Adda and colleagues^[6] presented a case in which it was impossible to withdraw the catheter. A chest computed tomography scan confirmed elongation and evidenced a loop around the heart, which could explain these difficulties. Given the patient's poor prognosis, the extracorporeal drain was cut and the remainder left in place.^[6] Wu and Shih^[7] reported a case of knot in a pericardial drain of a 31-year-old patient with lymphoma. A dilator was used to increase the diameter of the tract thus allowing the drain with the knot to be extracted.^[7] Chuang and Chiu^[8] described a drain withdrawal failure in a 83-year-old woman. Fluoroscopy revealed that the pigtail looped around the heart to form a slip knot. Forceful extraction strapped the heart even tighter. A thoracotomy was performed; a tightly twisted pigtail over the ventricular apex was noted. The knot was cut, and the pigtail was withdrawn smoothly.^[8]

The authors in these four cases offer a few suggestions to avoid these complications. Excess insertion of drainage catheter should be avoided. The redundancy of indwelling catheter allows knotting to happen.^[8] In this case, excessive drain length likely led to its coursing around the pulmonary artery. If any resistance is met with blind withdrawal, fluoroscopy may aid in removal.^[5] In the presented case, as the TTE was inconclusive, evaluating the drain under fluoroscopy may have been helpful rather than a second attempt at blind removal.

As in this case, it may be helpful to transfer to the OR if any difficulty is encountered. A patient in the OR, intubated, and under general anesthesia is in a much more controlled setting with resuscitation equipment readily available.

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Conflicts of interest

There are no conflicts of interest.

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