

Diagnosis of cardiac tamponade with transesophageal echocardiography following the induction of anesthesia for suspected testicular torsion

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ABSTRACT

Transesophageal echocardiography (TEE) is a valuable tool for evaluating hemodynamic instability in patients under general anesthesia. We present the case of a 28-year-old man who presented with complaints of testicular pain concerning for testicular torsion. After induction of general anesthesia for scrotal exploration and possible orchiopexy, the patient developed severe and persistent hypotension. Using intraoperative TEE, the diagnosis of pericardial tamponade was made, and an emergent pericardial window was performed.

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INTRODUCTION

Intraoperative transesophageal echocardiography (TEE) is indicated to evaluate persistent hypotension in the perioperative period.^[1] The use of TEE for this purpose may support current diagnoses or lead to the discovery of unexpected pathology. We describe the case of a healthy 28-year-old man who presented to the hospital with complaints of testicular pain. He was taken to the operating room for scrotal exploration and possible orchiopexy where, after induction of general anesthesia, he developed persistent and refractory hypotension. TEE examination revealed pericardial tamponade and led to the emergent performance of a pericardial window which resolved the patient's hemodynamic instability. The patient provided consent for the publication of this case report.

CASE REPORT

A 28-year-old male presented to the emergency department with complaints of severe right

testicular pain and swelling for the past 11 h. He stated the pain began acutely around 3 AM that morning with associated nausea. The previous day, he noted mild soreness in the right testicle which he attributed to having hit more than 100 golf balls at the driving range. He denied trauma to the area and reported being in a monogamous sexual relationship. His past medical history was significant only for mild intermittent asthma, and he noted allergies to cefaclor and certain types of alcohol. He denied any fevers, chills, or vomiting.

The patient was afebrile with a heart rate of 114 beats/min and blood pressure of 134/91 mmHg. Physical examination revealed a swollen, tender, and somewhat high-riding right testicle with a hydrocele. Laboratory testing was significant only for a white blood cell count of 13.6×10^9 cells/L. A urological surgery consultation was obtained for concerns of testicular torsion. A testicular ultrasound revealed normal testicular blood flow, normal bilateral epididymi, a large simple right hydrocele, a small left varicocele, and a possible right spermatic cord hematoma. Due

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to concerns that the patient's original complaints were secondary to testicular torsion that had spontaneously resolved, he was taken to the operating room for scrotal exploration with possible orchiopexy and orchiectomy.

General anesthesia was induced with propofol, fentanyl, midazolam, lidocaine, and succinylcholine, and endotracheal intubation was successful on the first attempt. Following induction and initiation of positive pressure ventilation, the patient's blood pressure progressively decreased from a preinduction mean arterial pressure (MAP) of 100 mmHg to a nadir of 40mmHg over a period of 30 min despite administration of 600 mL of normal saline, 400 mcg of phenylephrine in divided doses, and 500 mL of albumin. The patient's MAP increased to 60 mmHg only after temporary discontinuation of volatile anesthetic, serial administration of 10–50 mcg boluses of epinephrine and 2-8 unit boluses of vasopressin, and continued albumin administration. Hydrocortisone was administered in addition to epinephrine out of concern for a possible anaphylactic reaction.

During this period of hemodynamic instability, scrotal exploration revealed a normal right testicle with normal blood flow. A right-sided noncommunicating hydrocele with cord edema and varicosities was noted. As there was no significant pathology, the scrotal incision was closed, and there was minimal blood loss associated with the procedure.

As the surgical drapes were removed, it was noted that the patient was plethoric and that ST-elevation was developing in electrocardiogram leads II and V5. A TEE probe was placed for further evaluation of the patient's hypotension. TEE examination immediately revealed a 22 mm pericardial effusion with diastolic compression of the right atrium and right ventricle [Figure 1]. There was a mild, global decrease in systolic function with an estimated left ventricular ejection fraction (LVEF) of 45%, dilated inferior vena cava and hepatic veins, and spontaneous echo contrast in the IVC [Figure 2]. A diagnosis of pericardial tamponade was made, and the on-call cardiac surgeon was requested for the emergent consultation. A right internal jugular central venous catheter was placed and revealed a central venous pressure of 28 mmHg. An arterial blood gas sent at this time showed a lactate of 4.6 mmol/L. Upon arrival of the surgeon, a subxiphoid pericardial window was performed with drainage of approximately 500 mL of serous fluid and immediate stabilization of the

patient's hemodynamics without the continued need for vasopressors or inotropes.

On postoperative day 1, the patient was successfully extubated. He remembered a globus sensation that he had experienced the day prior to the presentation, but no other symptoms that may have raised suspicion for an intrathoracic abnormality. A follow-up transthoracic echocardiogram demonstrated normalized biventricular function with an LVEF of 60–65% and no residual pericardial effusion. Bacterial cultures of pericardial fluid and pericardial tissue were negative as well as those for acid-fast bacilli, fungus, and anaerobic bacteria. Viral myopericarditis was made as the diagnosis of exclusion. On postoperative day 3, the patient was discharged with orders to follow-up with his primary care physician, a urologist, and a cardiologist in the next 2–3 weeks.

DISCUSSION

In this report, we describe the case of a young, healthy male patient who was found to have pericardial tamponade following the induction of general anesthesia for suspected testicular torsion. Aside from tachycardia, the patient had no preoperative signs or symptoms concerning for tamponade or pericardial effusion. The diagnosis was made only after hemodynamic collapse necessitated the use of intraoperative TEE to aid in the diagnosis of hypotension.

Any cause of pericarditis can result in pericardial tamponade depending on the volume of effusion and rate of accumulation. The causes of pericarditis are multiple, including cancer,^[2] autoimmune disorders,^[3] tuberculosis,^[4] fungi,^[5] bacteria,^[6] acute myocardial infarction,^[7] radiation,^[8] uremia,^[9] and drug reactions.^[10]

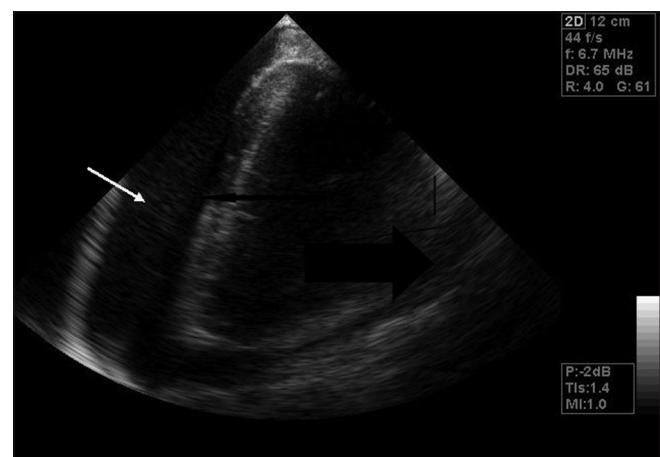


Figure 1: Transesophageal echocardiography left ventricular two-chamber view showing 22 mm pericardial effusion (arrow)

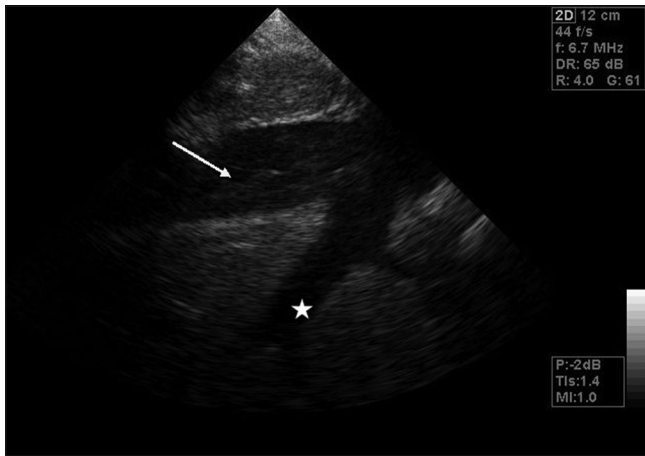


Figure 2: Transesophageal echocardiography view of the IVC (arrow) and hepatic veins (star) showing dilation and spontaneous echo contrast

However, the most common cause of pericarditis is viral.^[11] Viruses known to cause pericarditis include coxsackie virus,^[12,13] influenza,^[14,15] and adenovirus.^[16] The patient in this case had no known risk factors for a pericardial effusion including no renal failure, autoimmune disorders, known malignancy, or precipitating medication use. Postoperative testing of the serous pericardial fluid was uniformly negative, and a diagnosis of viral pericarditis was made.

Pericarditis and pericardial effusions do not invariably lead to pericardial tamponade. Normally, there is about 50 mL of fluid in the pericardial space.^[17] The noncompliant pericardium can accommodate an acute accumulation of 80 mL to 100 mL of fluid before pressures begin to rise rapidly.^[11] The rise in intrapericardial pressure impedes venous return to the right atrium and right ventricle resulting in hypotension, tachycardia, and pulsus paradoxus.

This patient was tachycardic but normotensive preoperatively, and he showed no evidence of tamponade such as elevated jugular venous pressure or cold and clammy extremities. Pulsus paradoxus, a classical sign of cardiac tamponade, was not measured as there was no indication of the patient's precarious hemodynamic state at that time. However, he experienced an acute drop in MAP following the induction of anesthesia and initiation of mechanical ventilation. Most likely, the patient's preoperative tachycardia was a compensatory response to tamponade. This tamponade led to hemodynamic collapse only after the induction of anesthesia due to the confluence of a number of factors. First, intravenous drugs administered to the patient during induction blunted his sympathetic outflow and compensatory

tachycardia. Second, volatile anesthetic agents used after induction resulted in venodilation and decreased cardiac preload. Finally, positive-pressure ventilation further impeded venous return through increases in intrathoracic pressure.

The cause of the patient's testicular pain is unclear. Surgical exploration of the scrotum revealed no evidence of torsion, but a hydrocele and varicosities were noted. Although the cause of many hydroceles is never discovered,^[18] they can develop in response to obstructed venous drainage from the testicle.^[19] TEE clearly showed impeded venous flow from the lower half of the body as evidenced by a dilated IVC with spontaneous echo contrast. Venous hypertension in the scrotum may have resulted in the development of a hydrocele as well as the varicosities which were noted. Hydroceles can cause discomfort which may have been exacerbated by the patient's physical activity the day before the presentation. Alternatively, enlargement of the right epididymis with inflammation was noted on the preoperative scrotal ultrasound. Epididymitis is a common cause of testicular pain that can also result in a hydrocele.^[19] Although most cases are attributed to the bacterial origin, viruses such as adenovirus can also cause epididymitis.^[20] As the patient's tamponade was likely due to pericarditis of viral origin, his testicular pain, and pericarditis may have been caused by the same virus.

This report describes the case of a man with undiagnosed cardiac tamponade that only became apparent after induction of general anesthesia for an unrelated diagnosis. Several factors common to most general anesthetics combined to ablate the patient's hemodynamic compensation and cause cardiovascular collapse. Although multiple diagnoses were considered to explain the patient's hypotension, the ability of TEE to aid in the diagnosis of intraoperative hemodynamic instability was demonstrated. Interestingly, the symptom of scrotal pain that brought the patient to the hospital may have been the direct result of venous hypertension due to tamponade or, alternatively, a common virus may have led to both pericarditis and epididymitis.

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