

Delayed Cardiac Tamponade after the Nuss Procedure for Pectus Excavatum: A Case Report and Simple Management

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ABSTRACT

A 22-year-old man presented at our emergency department with clinical signs of cardiac tamponade that required emergency surgery. We treated this patient by using emergency echocardiographically guided pericardiocentesis with insertion of a central venous catheter for drainage without removal of the steel bar. The causes of his pericardial effusion appeared to have been displacement of the bar from a pectus excavatum repair 6 months previously and his ingestion of ginseng extract. This case illustrates a possible cause of cardiac tamponade after the Nuss procedure and a simple way to manage it.

INTRODUCTION

In 1998, Nuss introduced an innovative new technique for correcting pectus excavatum without resection of cartilage. Complications of the Nuss procedure for pectus excavatum include pneumothorax, wound seroma, pericarditis, pericardial effusion, bar displacement, and hemothorax. We report a case of delayed cardiac tamponade that occurred 6 months after the patient underwent the procedure, a case that we treated in a simple way.

CASE REPORT

A 22-year-old man was admitted to our center in June 2006 for repair of pectus excavatum with the Nuss procedure. He returned to our hospital in October 2006 because of exposure of the wire and displacement of the steel bar. He underwent debridement of the wound. In November 2006, the patient presented with complaints during the previous week of anorexia and progressive onset of severe, sharp chest pain with radiation to the left shoulder and mild dyspnea. The results of an examination of other details of the patient's

medical history were negative. The patient was taking no medications other than ginseng extracts. He denied trauma to the chest. The patient appeared tachypneic and orthopneic, and a physical examination revealed the following: temperature, 38.3C; pulse rate, 112 beats/min; blood pressure, 90/60 mm Hg; and respiratory rate, 48/min. The jugular vein was engorged. Cardiopulmonary auscultation revealed muffled and distant heart sounds. Pulsus paradoxus was detected. An electrocardiogram showed a low voltage without acute changes. A chest radiographic study identified a large cardiac silhouette (Figure 1). The laboratory results

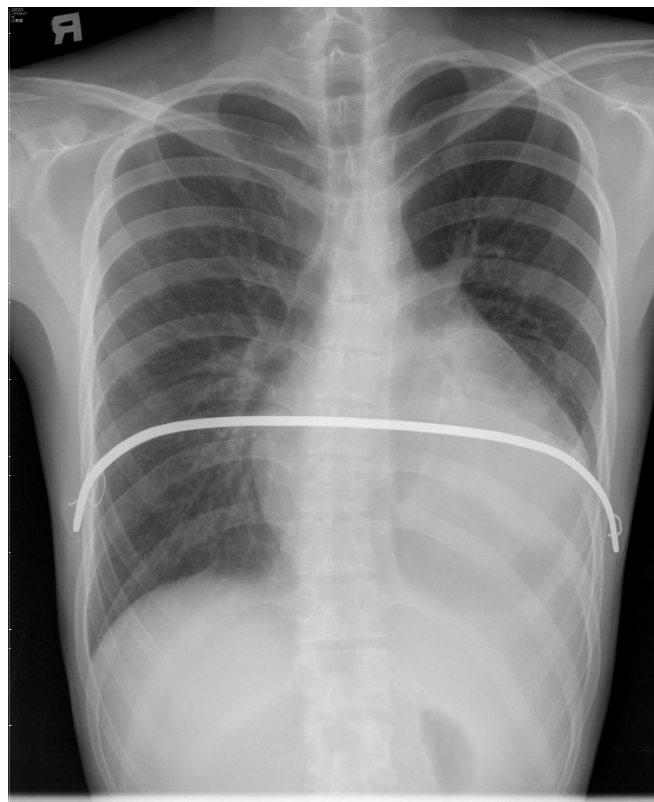


Figure 1. A chest radiograph obtained on the patient's admission to the hospital demonstrates a moderately enlarged cardiac silhouette and displacement of the steel bar.

Received December 9, 2007; accepted February 7, 2008.

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were as follows: hemoglobin, 13.7 g/dL; white blood cells, 14,600/mm³; platelets, 462,000/mm³; international normalized ratio of prothrombin time (PT), 1.7; and activated partial thromboplastin time (aPTT), 48.8 seconds. An echocardiographic investigation revealed massive pericardial effusion and diastolic right ventricular compression, which are the classic signs of cardiac tamponade (Figure 2).

Urgent echocardiographically guided pericardiocentesis is indicated for a patient identified as being in cardiac tamponade. We determined that the point on the body surface where the effusion was closest to the transducer and where fluid accumulation was maximal was a point over the sixth intercostal region, 1.5 cm from the left sternal border. Avoiding the internal thoracic artery (3-5 cm from the sternal border) and the vascular bundle at the inferior margin of the rib, we advanced an 18-gauge needle on a 5-cm³ syringe in the direction of the fluid space, aspirating as we advanced the needle until a flush of pericardial fluid was returned. More than 800 mL of bloody fluid was removed from the pericardium. A central venous catheter was inserted (Figure 3). After the pericardiocentesis, the blood pressure improved to 110/70 mm Hg. The pericardial fluid was red and turbid, with 856,200 red blood cells/mL and 4800 white blood cells/mL. Immediately after the procedure, we prescribed 25 mg indomethacin to be administered 3 times daily. By day 7, the output from the drain had nearly stopped, and 2 follow-up echocardiograms recorded during this period showed that the effusion had largely resolved. The drain was then removed. Follow-up chest radiographs revealed no signs of fluid reaccumulation (Figure 4), and the patient was discharged on day 9 in an improved condition. The results of analyses of the fluid were negative for bacterial culture, acid-fast bacilli, fungal culture, and malignant cells. The patient took indomethacin for another 2 months and was instructed not to take ginseng extracts. At the 2-month follow-up, he was in good health and had no fluid reaccumulation in the pericardial space and no prolongation in the PT or the aPTT.

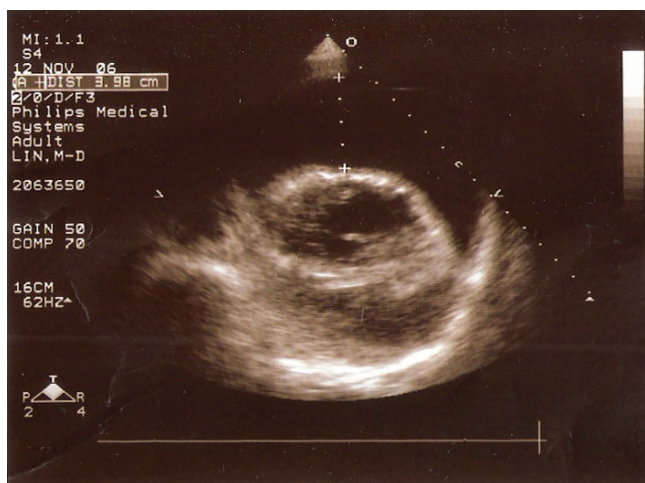


Figure 2. Echocardiogram demonstrating a pericardial effusion 3 to 4 cm in circumference.



Figure 3. Postoperative chest radiograph showing a much-improved heart shape after catheter insertion.

DISCUSSION

The Nuss procedure for pectus excavatum has become increasingly popular because of its simplicity and good results. A variety of complications can occur, and life-threatening conditions have sometimes been reported. The complication rate for pericardial effusion after the Nuss procedure for pectus excavatum is 0% to 2.5%.

Cardiac tamponade is rarely found after this procedure. The typical clinical presentation of cardiac tamponade is a falling blood pressure, an elevated systemic venous pressure, and a small, quiet heart sound. The patient may experience severe shortness of breath, chest tightness, and, occasionally, pericardial pain. The tamponade can be acute or chronic, with compression of the heart from the accumulation of fluid, pus, or gas in the pericardial space. Cardiac compression can cause circulatory decompensation because of the increased intrapericardial pressure. Increased intrapericardial pressure causes reduced ventricular volumes and elevated ventricular diastolic pressure, followed by decreases in stroke volume, cardiac output, and blood pressure.

The etiology of the pericardial effusion-induced cardiac tamponade in this case appears to be related to postpericardiotomy syndrome. Displacement of the steel bar or trauma to the pericardium when creating the substernal tunnel may cause pericarditis, which induces a pericardial effusion. The pathophysiology is hypothesized to be an autoimmune reaction.

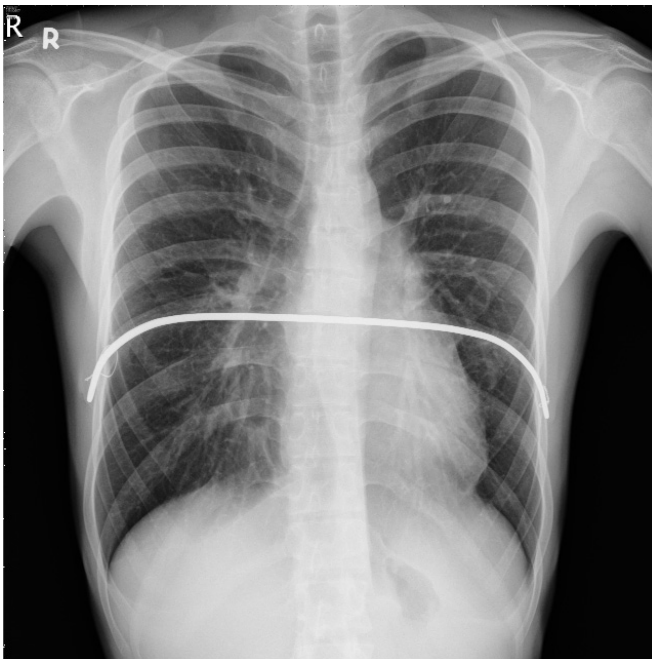


Figure 4. A follow-up chest radiograph 9 days after the operation revealed no signs of fluid reaccumulation.

Damage to the pericardium induces the production of immune complexes that are deposited on the pericardial surfaces and cause a local inflammatory reaction with exudation. Although postpericardiotomy syndrome is usually benign, it may increase the risk of arrhythmias or mortality due to cardiac tamponade. Anti-inflammatory therapy, such as with nonsteroidal anti-inflammatory drugs, is effective treatment for postpericardiotomy syndrome.

Other possible reasons for the production of pericardial effusion are progressive bleeding into the pericardial space due to microperforation of blood vessels and coagulopathy. Displacement of the steel bar may have been the major cause of the injured vessels in our patient. By the time the cardiac tamponade had developed, he had taken ginseng extracts for approximately half a year. Ginseng has been reported to have antiplatelet and antithrombotic activities. Ginsenosides inhibit platelet aggregation *in vitro* and in laboratory rats, prolonging both the PT and the aPTT. It inhibits various agonist-induced serotonin secretions by platelets. Teng et al. [1989] reported that the antiplatelet activity of panaxynol, a constituent of ginseng, might be irreversible in humans.

Pericardiocentesis is an absolute indication for cardiac tamponade and hemodynamic compromise. Under echocardiographic guidance, urgent pericardiocentesis can be performed successfully and safely, and samples of the pericardial fluid can be obtained for diagnostic analyses without

performing more invasive procedures. The success rate is 99%, and the complication rate is low (2%-3%), without mortality. It is safer than alternative procedures, such as surgical creation of a pericardial window or total pericardiectomy. Placement of a central venous catheter can drain the fluid adequately until anti-inflammatory drugs achieve their full effect. Combined treatment with oral anti-inflammatory drugs and surgical drainage is effective and safe. For our patient, the steel bar was not removed, and no thoracotomy was needed. The Nuss procedure for pectus excavatum can lead to life-threatening situations that may manifest as early or late complications. Regular follow-up in the outpatient department is necessary after surgery. Even if complications do occur, their management can be simple without the need for complicated procedures.

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