Reconstruction of occluded thoracic duct for treatment of chylopericardium: A novel surgical therapy

Rowlens M. Melduni, MD, Jae K. Oh, MD, T. Jared Bunch, MD, Lawrence J. Sinak, MD, and Peter Gloviczki, MD, Rochester, Minn

Chylopericardium is an uncommon disease predominantly caused by trauma. Prolonged chyle depletion may result in nutritional, metabolic, and immunologic deficiencies due to loss of essential proteins, immunoglobulins, fat, vitamins, electrolytes, and water. Medical treatment includes a low-fat diet with medium-chain triglyceride restriction, cardiac support, diuretic medications, and drainage of the pericardial effusion. Conventional surgical therapy consists of pericardial fenestration and thoracic duct ligation. We report a case of massive secondary chylous pericardial effusion successfully treated with microsurgical lymphovenous anastomosis, reconnecting the occluded thoracic duct to the internal jugular vein. This case highlights features and management strategies of this perplexing clinical condition. (J Vasc Surg 2008;48:1600-2.)

Chylopericardium is an uncommon disease predominantly caused by trauma. Prolonged chyle depletion may result in nutritional, metabolic, and immunologic deficiencies due to loss of essential proteins, immunoglobulins, fat, vitamins, electrolytes, and water. Medical treatment includes a low-fat diet with medium-chain triglyceride restriction, cardiac support, diuretic medications, and drainage of the pericardial effusion. Conventional surgical therapy consists of pericardial fenestration and thoracic duct ligation. We report a case of massive secondary chylous pericardial effusion successfully treated with thoracic duct–internal jugular vein anastomosis.

CASE REPORT

A 74-year-old woman was referred to Mayo Clinic because of 4 months of persistent chylous pericardial effusion after a fall against a table. The patient reported weight loss, weakness, fatigue, chest discomfort, and dyspnea, which persisted for a month after pericardiocentesis at a local hospital. At our institution, results of physical examination were unremarkable. An echocardiogram showed a large posterior pericardial effusion. Approximately 500 mL of pericardial fluid with a milky appearance was aspirated through a pigtail catheter. Laboratory analysis was consistent with a chylous effusion.

An extensive evaluation was undertaken to find the cause of the chylous pericardial effusion. Computed tomographic scans of the chest, abdomen, and pelvis showed no evidence of malignancy. A lymphangiogram showed typical lymphatic drainage of the pelvis and abdomen, but the distal thoracic duct was distended, and the proximal thoracic duct immediately below the junction of the subclavian and jugular veins was occluded. Numerous dilated lymphatic collaterals were seen in the chest and mediastinum. A venogram showed patent internal jugular and innominate veins and a widely patent superior vena cava.

Initially, the patient was treated conservatively with drainage of the pericardial space and restriction of dietary fat to medium-chain fatty acids. Despite these measures, the daily output of 500 mL of chylous pericardial fluid persisted. We concluded from our clinical investigations that the chylopericardium was due to proximal thoracic duct occlusion with reflux of chyle into the pericardium through lymphatic collaterals; therefore, we opted for release of the thoracic duct occlusion to decrease reflux of chyle into the pericardial space.

The patient was fed a high-fat meal of 60 g of butter with a glass of whipped cream 4 hours before the operation to enhance both chyle production and visualization of the thoracic duct. A 5-cm transverse incision was made just superior to the clavicle, and the lateral head of the sternocleidomastoid muscle was transected.

From the Division of Cardiovascular Diseases and the Division of Vascular and Endovascular Surgery, Mayo Clinic.

Reprint requests: Rowlens M. Melduni, MD, Division of Cardiovascular Diseases, Mayo Clinic, 200 First St, SW, Rochester, MN 55905 (e-mail: melduni.rowlens@mayo.edu).

0741-5214/$34.00
Copyright © 2008 by The Society for Vascular Surgery.
doi:10.1016/j.jvs.2008.06.066
1600
The supraclavicular fat pad was exposed, and the internal jugular vein and the thoracic duct were dissected. The thoracic duct was proximally occluded, but distally it was patent, tortuous, and dilated to a diameter of 3 mm (Fig 1). The patient received heparin. The internal jugular vein was cross-clamped proximally and distally and opened longitudinally on its posterior wall. With the use of an operating microscope, an end-to-side anastomosis was performed between the duct and the vein with interrupted 8-0 monofilament suture (Fig 2). To avoid injury and ensure continuous chyle drainage, the thoracic duct was not clamped during the anastomosis. After completion of the anastomosis, chyle filled the clamped internal jugular vein segment well (Fig 3). The wound was closed over a small drain.

The patient’s postoperative course was uneventful. In six 12-hour intervals after surgery, the amounts of pericardial catheter drainage were 250, 112, 43, 17, 12, and 12 mL. A predismissal echocardiogram showed no pericardial effusion. On postoperative day 6, the pericardial catheter was removed, and the patient was dismissed from the hospital. She was prescribed warfarin for 3 months for prevention of thrombosis and early occlusion of the microvascular anastomosis, especially in the vein and at the suture line. The restriction of her dietary fat was continued for 3 months.

A postoperative follow-up echocardiogram at 4 months showed only a small posterior pericardial effusion. The pericardial effusion, as well as the patient’s symptoms, had completely resolved 3 months later.

DISCUSSION

We describe the first reported case, to our knowledge, of a chylous pericardial effusion due to thoracic duct obstruction successfully treated with microsurgical reconstruction of the occluded thoracic duct through an end-to-side anastomosis between the thoracic duct and the left internal jugular vein that left the pericardium intact. This approach is most consistent with restoration of nearly normal physiology.

When the thoracic duct is obstructed at the level of the ostium, reflux of chyle into the pericardium can occur through collateral lymphatic channels or because of incompetence of the mediastinal lymphatic valves due to elevated lymphatic pressure. Our patient most likely had intrinsic disease of her lymphatic system with minimal reserve. The fall against the table likely resulted in inflammation of the lymphatic vessels and occlusion at the level of the thoracic duct, with consequent development of symptomatic secondary chylous pericardial effusion. Therefore, treatment of the obstruction that returns lymphatic flow to a relatively normal system may cure the condition without need of such additional invasive therapies as pericardiectomy or pericardial window.

Nonetheless, although thoracic duct reconstruction results in substantial symptomatic improvement and volume reduction, the condition may recur. Recurrence may result because of a persistent defect of the ruptured lymphatics with lymphopericardial or lymphothoracic fistula, especially in patients with persistent lymphatic dilation and valvular incompetence. Recurrence may also be due to technical failure, causing stenosis, occlusion, or rupture of the duct. Recurrences should be managed conservatively because it may take some time before normal lymphatic flow is fully restored. In cases of prolonged time to recovery, a lymp-
phangiogram should be obtained to rule out anastomotic leak, stenosis, or occlusion.

The optimal management of chylopericardium is not well known because the condition is rare and no large prospective studies or guidelines are available. In the absence of a history of direct trauma with temporal correlation of the onset of symptoms, mediastinal malignancy must be excluded. Conservative management aimed at decreasing lymphatic output and decreasing chyle production is the first stage of therapy, followed by intermittent percutaneous drainage of the pericardial effusion and nutritional support to replace the lipids and albumin lost in the chyle. Open or thoracoscopic surgery is the next step.6

There is no standard approach to guide the duration of conservative therapy before a surgical intervention is planned.5,6 Patients who are draining <500 mL of pericardial fluid in the first 24 hours after cessation of oral intake and the initiation of total parenteral nutrition tend to improve with conservative management. By comparison, patients from whom >1 L of fluid drains daily may benefit from surgical intervention within 5 to 7 days.7 Prolonged drainage of a chylopericardium should be avoided to prevent immunosuppression and malnourishment,4 which may limit the patient’s tolerance to definitive surgical therapy.

Standard surgical treatment includes fenestration of the pericardium to connect the pericardiac space with the pleura and facilitate absorption of the fluid. In addition, open or thoracoscopic ligation of the thoracic duct low in the chest has been recommended to decrease chyle flow to the upper chest and the mediastinum.8 Ligation of chylous leaks and sites of lymphatic ruptures can also be attempted after the patient has a meal with high fat content.9

In our patient, we used a microsurgical lymphovenous anastomosis to reconstruct the occluded thoracic duct at the base of the neck and reestablish a nearly normal physiology of lymphatic drainage, thereby successfully treating, for the first time, chylopericardium with thoracic duct reconstruction without the need for thoracic duct ligation or pericardiectomy.

We acknowledge the following individuals who were involved in the care of the patient for their helpful review and commentary in preparation of this manuscript: Michael D. McGoon, MD, and Manju Kalra, MBBS.

REFERENCES

Submitted Mar 24, 2008; accepted Jun 25, 2008.