Case Reports

Conservative Management of Chylothorax

after Coronary Artery Bypass Grafting

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Chylothorax is a rare sequela to cardiac surgery, associated with high rates of morbidity and mortality. There are various medical and surgical options for its management. We describe 2 cases of chylothorax that developed after coronary artery bypass grafting and were managed successfully with medical therapy alone.

Conservative treatment such as we describe aims to reduce chyle flow, to drain the pleural cavity in an effective manner, and to prevent chronic sequelae. Optimal conservative treatment, consisting of nothing by mouth and the administration of a pleurodetic agent, should be started immediately upon diagnosis. In most cases, it reduces the need for reoperation and long-term hospitalization. Prospective randomized controlled trials are nonetheless needed to confirm these assumptions. ***(Tex Heart Inst J 2015;42(2):148-51)***

Chylothorax is rare as a sequela to cardiac surgery. Its prevalence in cardiothoracic procedures is 0.3% to 1.5%; after median sternotomy, it is still more unusual.[1,2] It is more frequent in pediatric than in adult cardiothoracic surgery.[3-5] Postoperative chylothorax is associated with high rates of morbidity and mortality.[6] It can cause metabolic disturbances, nutritional deficiencies, respiratory disorders, immunodeficiency and infections, prolonged hospitalization, and high treatment costs.[7,8]

Chylothorax after coronary artery bypass grafting (CABG) is rare, but it occurs most often if the left internal mammary artery (LIMA) has been used as a graft. We describe 2 cases of chylothorax that developed in adults after CABG, both of which were treated successfully with medical therapy alone.

Key words: *Chylothorax/diagnosis/therapy; coronary artery bypass/adverse effects; pleurodesis; postoperative complications; somatostatin; thoracic duct/injuries*

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Patient 1

A 60-year-old man was admitted to our institution after a sudden onset of chest pain that radiated to his left arm. Coronary angiographic results led our heart team to perform CABG.

After a median sternotomy, the LIMA was harvested as a peduncle, the pleura was incised, and the saphenous vein was harvested. First, the reversed saphenous vein graft was anastomosed to the 2nd diagonal branch (D2). Then the LIMA was anastomosed to the left anterior descending coronary artery (LAD). After the proximal anastomosis, the patient was weaned from cardiopulmonary bypass.

The operative and first postoperative days were eventless. On the 2nd postoperative day, pale pink discoloration of the pleural drainage fluid was noticed. Chylothorax was diagnosed when biochemical analysis of the pleural fluid revealed total cholesterol, 43 mg/dL; triglycerides, 398 mg/dL; glucose, 67 mg/dL; and total protein, 2.7 g/dL. Pleural drainage was 100 to 250 mL/d.

From the outset, the patient was given nothing by mouth but received, via total parenteral nutrition (TPN), a low-fat diet rich in medium-chain fatty acids (MCFA) (total calorie intake, 1,800 kcal/d. In addition, intravenous somatostatin was started (infusion rate of 3.5 μg/kg/hr for the first 48 hr, increased to 5 μg/kg/hr for the next 48 hr, and then to 7 μg/kg/hr for the 3rd 48 hr). No side effects—such as hypersensitivity, hypotension, or hypoglycemia—were noted.

On the 7th postoperative day, the patient's oral intake of a low-fat diet was started. The pleural drainage fluid decreased during the course of this conservative therapy. The chest tube was removed on postoperative day 13, after the drainage of fluid had ceased. Follow-up chest radiography yielded normal results. The patient was dis-

charged from the hospital on postoperative day 14. At his 1-year follow-up examination, he was doing well, without recurrence of pleural effusion.

Patient 2

A 46-year-old man was admitted to our hospital with unstable angina and complete atrioventricular block. He had coronary artery disease risk factors such as diabetes mellitus, a long-term history of smoking, and obesity. Coronary angiograms revealed a 20% to 30% stenosis of the left main coronary artery, a 60% to 70% stenosis of the mid LAD, an 80% stenosis of the D2, and a long 80% stenosis of the right coronary artery.

The patient underwent CABG. After a median sternotomy, the LIMA was harvested as a pedicle, the pleura was incised, and 2 saphenous vein grafts were harvested. The reversed saphenous vein grafts were anastomosed to the D2 and to the right posterior lateral coronary artery. Then the LIMA was anastomosed to the LAD. After the proximal anastomosis, the patient was weaned from cardiopulmonary bypass.

Chest tube drainage was normal and serosanguineous until postoperative day 3. When the pleural fluid turned chyliform, the diagnosis of chylothorax was established via biochemical testing. Analysis of the pleural fluid revealed total cholesterol, 36 mg/dL; triglycerides, 276 mg/dL; glucose, 123 mg/dL; and total protein, 2.3 g/dL. Pleural drainage was 100 to 350 mL/d. The patient's oral feeding was stopped, and TPN was started. The thoracostomy tube was kept in place. Somatostatin therapy was started as described in the case of Patient 1.

Beginning on postoperative day 7, we allowed oral intake of a low-fat diet. Pleural drainage decreased during the course of this conservative therapy. The chest tube was removed on postoperative day 14, after drainage had ceased. Follow-up chest radiographs were normal. The patient was discharged from the hospital on postoperative day 15. At his 1-year follow-up examination, he was doing well, without recurrence of pleural effusion.

Discussion

Postoperative chylothorax is an infrequent sequela to cardiothoracic surgical procedures, yet it has serious consequences.[8] Although the prevalence of chylothorax after median sternotomy is very slight (0.5%, on average[7]), pleural effusions should be monitored for chylothorax after cardiothoracic surgery.

Morbidities are severe: chylothorax causes nutritional deficiencies, respiratory dysfunction, dehydration, malnutrition, immunosuppression, and infections that lead to prolonged hospitalization and high treatment costs.[7] The mortality rate in association with postoperative chylothorax can reach 50% when treatment is inadequate.

In general, postoperative chylothorax after myocardial revascularization occurs in patients who have undergone LIMA-graft harvesting. As a precaution, the surgeon should maximize the conduit's length at the proximal end of the pedicle. The use of electrocautery during LIMA harvesting appears to be the chief destructive mechanism.[2] Abnormalities of the lymphatic collateral circulation are another possible cause of chylothorax.

The thoracic duct begins at the cisterna chyli on the body of the first or second lumbar vertebra and then passes upward in the thorax. It ascends into the chest. In most cases, it ends at the junction of the left internal jugular vein and the left subclavian vein. (Incidentally, the left anterior mediastinal lymph node chain usually connects with the left jugulosubclavian venous junction.) In its course, the thoracic duct crosses the LIMA near its origin at the apex of the thorax. Because of anatomic proximity, harvesting of the LIMA is the principal cause of damage to the lymphatic vessels or thoracic duct.[9,10] Damage to thymic lymphatic channels during division of the thymus by electrocautery is a probable cause of chyle leakage. In their reported case of chyle drainage secondary to valve replacement surgery, Tasoglu and colleagues[11] suspected their use of electrocautery.

We have analyzed the English-language reports of chylothorax cases that occurred after CABG.[1,2,6,7,12,13] In 2001, for example, Fahimi and associates[7] presented 12 cases of postoperative chylothorax, 3 of which developed after use of a LIMA graft for CABG. Similarly, in 2006, Barbetakis and colleagues[2] reported 23 cases of chylothorax that developed after CABG; in 19 of those cases, the LIMA had been used as a graft. In 2 of the remaining 4 patients, chylothorax affecting the right hemithorax was seen: in those patients, the right internal mammary artery had been harvested. (In the remaining 2 patients, only saphenous vein grafting had been performed, yet chyle drainage also developed.)

Usually, the first step of chylothorax diagnosis is established clinically. Chylothorax should be considered when the postoperative pleural effusion develops. That effusion's main feature is the consistency of its milky fluid. A chyliform effusion comprises chylomicrons and long-chain triglycerides[7] and has a creamy appearance. Diagnosis should be supported by biochemical analysis of the chyliform fluid: that analysis must show a triglyceride level of >110 mg/dL and a cholesterol-to-triglyceride ratio <1.6. In our 2 patients, the results of biochemical analysis met these standards.

Pleural fluid drainage should be the first step in the management of chylothorax.[1,2,6] The other main components of conservative treatment are stopping oral feeding and beginning (through TPN) a low-fat diet rich in MCFA. Somatostatin, OK-432, octreotide (a long-acting somatostatin analog), and etilefrine hydrochloride are some of the available pleurodetic agents. The success rate of these agents in treating postoperative chylothorax is higher than 80%.[14-16]

After confirming the diagnosis with biochemical tests in our patients, we started the conservative treatment protocol. The stopping of oral feeding produces a substantial reduction in lymph production.[17] An enriched low-fat MCFA oral diet was begun on the 7th postoperative day, in order to provide adequate caloric intake while minimizing the chyle flow in the thoracic duct. In the meanwhile, healing could occur at the leakage site.[18]

We retained the thoracostomy tube until drainage of the chyle stopped. This drainage lasted for 13 days in Patient 1 and for 14 days in Patient 2. Pleural fluid drainage is the main component of postoperative chylothorax management and can prevent additional sequelae.

Somatostatin is a polypeptide with mainly inhibitory actions on the hormones that release lymph fluid. The use of somatostatin or its analog is an important part of conservative treatment. Somatostatin inhibits a wide array of physiologic regulatory functions in the gastrointestinal tract and pancreas.[9] Somatostatin's mechanism of action is thought to lie in reducing gastrointestinal blood flow, reducing lymphatic flow, and inhibiting intestinal motility.[19] Because the gastrointestinal secretory volume and enzymes are decreased by somatostatin, it is reasonable to expect a decrease in the volume and protein content of thoracic duct chyle as well.[9] We did not use a long-acting synthetic somatostatin analog, such as octreotide. We decided to use somatostatin itself, to avoid side effects. We believe that short-acting drugs, during the postoperative period, are better for hemodynamically unstable patients.

There are various alternatives in the management of postoperative chylothorax. If conservative treatment is ineffective, or if the case of chylothorax is "high-flow," reoperation will become necessary. Radiographic embolization has been proposed as an alternative to surgery.[20] In selected cases, video-assisted thoracic surgery (VATS) should be considered in the treatment of chylothorax.[21] Fahimi and colleagues[7] suggested the use of VATS in the treatment of postoperative chylothorax when daily leakage exceeds 200 mL after 2 weeks of conservative therapy. However, pleural drainage in excess of 200 mL/d existed for only a couple of days in our patients; it decreased gradually, and then totally ceased on the 13th day in Patient 1 and on the 14th day in Patient 2. Therefore, the need for thoracoscopy never arose. We think that VATS should be kept in mind as an important alternative for leakage of high volume or long duration. In addition, ligation of the thoracic duct can be the best method in selected cases. Customarily, the main indication for ligation of the thoracic duct is failure of conservative management. Ligating the thoracic duct should be considered when persistent leakage rates are greater than 1,000 mL/d over 5 days of strict starvation, when chyle leakage lasts longer than 2 weeks, or when nutritional or metabolic complications interfere.[9]

In conclusion, conservative treatment aims to reduce chyle flow, to drain the pleural cavity in an effective manner, and to prevent chronic sequelae.[20] Optimal conservative treatment, started immediately upon diagnosis, effectively reduces the need for reoperation and long-term hospitalization, and it might prevent further sequelae of chylothorax. Prospective randomized controlled trials are nonetheless needed to confirm these assumptions.

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