Conservative treatment of postoperative chylothorax with octreotide

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Chylothorax is a rare but serious and well-recognized complication of general thoracic and cardiac procedures. No new invasive or non-invasive definitive therapies are available. This article reports the case of a 67-year-old woman who underwent myocardial revascularization and who developed a postoperative chylothorax necessitating continuous drainage and conservative management. When after 1 week this treatment still had not resolved the chylothorax, octreotide was instituted, leading to a rapid cessation of chyle production and rendering surgical management of this complication unnecessary.

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Introduction

Since thoracic duct ligation was introduced in 1948 by Lampson[1] for the surgical treatment of chylothorax, no new invasive or non-invasive definitive therapies have been available. We report our experience using octreotide, a somatostatin analog, in an adult who presented with chylothorax after cardiac surgery.

Case report

A 67-year-old diabetic woman underwent a single coronary artery bypass grafting (CABG) uneventful operation with a pedunculated left internal mammary artery (LIMA) anastomosed to the left anterior descending coronary artery. On postoperative day 2 the chest tubes were removed and the diabetic diet resumed; at that time chylous drainage was not noted and chest X-ray was unremarkable. On postoperative day 10 the patient started to complain of progressively debilitating weakness and dyspnea. Chest X-ray showed a large left pleural effusion. A chest tube was placed draining 3000 ml of milky fluid: the culture results were negative, whereas chemical analysis revealed triglycerides 510 mg/dl, and the presence of chylomicrons. The patient was put on *nil per os* and started on total parenteral nutrition; after 24 hours the drainage fell to 300 ml/day, stabilizing at this level for 6 days. Because this amount of drainage was felt to be too great to reabsorb if the chest tube was removed or diet resumed, subcutaneous octreotide, 100 μg tid, was started on postoperative day 17, using the minimum dosing recommendations for treatment of a pancreatic fistula and monitoring the drainage response as well as any effect on blood sugar levels. The tube drainage fell to 100 ml after 24 hours, stabilizing at < 20 ml/day during the following days; the fluid became watery and yellow. Due to the immediate decrease in drainage, there was no need to increase the dose of octreotide; no change in the insulin regimen was required. On postoperative day 24 octreotide and total parenteral nutrition were discontinued and enteral nutrition was resumed. The drainage always persisted below 20 ml/day; chemical analysis revealed triglycerides 11 mg/dl, with no chylomicrons. The chest tube was removed on postoperative day 28; daily radiographs confirmed no reaccumulation of fluid. The patient was discharged on postoperative day 35 (Fig. 1).

Discussion

The thoracic duct is the main collecting channel of the lymphatic vessels draining most of the lymph of the body below the diaphragm and from the left half of the body above the diaphragm. It extends upwards from the upper end of the cisterna chyli opposite the upper lumbar vertebrae through the aortic orifice of the diaphragm and an-

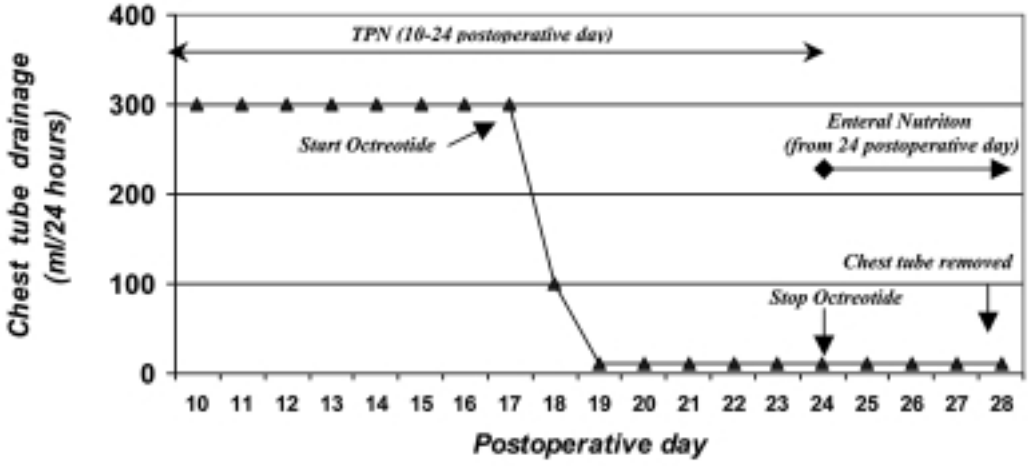

Figure 1. *Chest drainage in relationship to total parenteral nutrition (TPN), octreotide and enteral nutrition.*

terior to the thoracic vertebrae in the posterior mediastinum until it reaches the root of the neck on the left side of the esophagus where it arches upwards, forwards and then downwards to terminate in the junction of the left internal jugular and subclavian veins. It may terminate in either vein or give rise to branches which open into both veins. Unusual routes are found in 40 to 60% of the population[2].

Chylothorax after CABG is an uncommon complication, but does occur particularly when a LIMA graft is used[3]: Brancaccio et al.[4] reviewed 17 cases of chylothorax documented in the literature after a coronary revascularization procedure and found that in 13 cases the LIMA was harvested. The possible causes of chylothorax after LIMA harvesting are both the complete transection of the thoracic duct where it drains into the jugular-subclavian venous junction and the disruption or dissection of the collateral lymphatic vessels, proximal to the jugular-subclavian venous junction. Brancaccio et al. hypothesized that the lymphatic injury after LIMA harvesting is due to dissection at the proximal end of the pedicle in order to allow for extra length of the conduit and recommended to avoid electrocautery dissection when the inferoposterior aspects of the subclavian vein is exposed, due to the fact that lymph contains less coagulable material than plasma, rendering electrocauterization an unreliable means of controlling lymphatic leakage. In their article, Brancaccio et al. did not deal with the problem of the LIMA surgical harvesting technique, i.e. pedunculated vs skeletonization: since the skeletonization technique avoids the extensive use of electrocautery, we believe that theoretically it could be associated with a lower incidence of lymphatic injury during LIMA harvesting.

Other possible causes of chylothorax after CABG are duct injury following central line placement[5], the use of a tape around the superior vena cava or a venous thrombosis during cardiopulmonary bypass causing an increased superior vena cava pressure with obstruction to the drainage of chyle and consequent extravasation[4], or a thrombosis with occlusion of the thoracic duct causing a rise in pressure within the lymphatic system and back-flow from this through ruptured lymphatic vessels[6].

Since the central line was placed in the right internal jugular vein, there was no evidence of venous thrombosis and tape was not used, the volume of drained fluid was only moderate, and its appearance was rather delayed, in our patient, the likely injury was of a branch of the thoracic duct rather than complete transection during LIMA harvesting. The late clinical presentation was probably due to the fact that immediately after operation the patient was quite anorexic and this slowed chyle formation and accumulation.

The conservative therapy is based on keeping the patient *nil per os* with total parenteral nutrition or using a low-fat diet with medium chain triglycerides, associating in both cases a pleural drainage. The need for invasive therapy depends on both the amount and duration of drainage: Cerfolio et al.[7] recommend the surgical option by 1 or 2 weeks if output remains > 1000 ml/day or if drainage or lung expansion is incomplete, considering earlier reoperation if the drained volume is higher or chylothorax occurs after an esophageal operation; Selle et al.[8] recommend reoperation when the chylous leakage persists for at least 5 days at the rate ≥ 1500 ml/day in adults and when the drainage of chyle does not decrease within 2 weeks or the patient's nutrition or metabolic status markedly deteriorates during the same period; Shimizu et al.[9] propose immediate reoperation to expedite recovery and minimize hospitalization if the chest tube drainage exceeds 500 ml during the first 24 hours after complete oral intake cessation and total parenteral nutrition. If conservative therapy fails, a logical approach would be a minimally invasive procedure such as thoracoscopic duct ligation or radiological intervention with duct embolization[10], reserving

open thoracotomy for duct ligation as the final approach.

Octreotide, a parenteral synthetic analog of the hormone somatostatin, has a similar activity, greater selectivity, and a longer half-life with the advantage of subcutaneous administration. Somatostatin inhibits several pituitary hormones; the inhibition of serotonin and other gastrointestinal peptides results in an increased intestinal absorption of water and intestinal transit time, and a decreased pancreatic and gastric acid secretion. It also increases splanchnic arteriolar resistance and decreases gastrointestinal blood flow and thus secondarily reduces lymph flow. Possible adverse effects of somatostatin administration are fluid retention, hyponatremia on administration without restricting fluid intake, stomach ache, headache, nausea, vomiting, meteorism, and epistaxis. Allergic reactions ranging from urticaria to anaphylaxis may occur. Furthermore, because somatostatin modulates blood glucose homeostasis, the blood glucose levels should be monitored every 6 hours during treatment. Indications for octreotide therapy include endocrine tumors, variceal bleeding in portal hypertension, gastrointestinal diseases (pancreatitis, refractory diarrhea, pancreatic and intestinal fistulas), and reduction of lymph flow in chylous ascites[11].

In the canine model, Markham et al.[12] evaluated the effects of octreotide for the treatment of thoracic duct transection and concluded that octreotide is effective, leading to an early decrease in the drainage of chyle and early chylous fistula closure.

There have been several reports of somatostatin being used for chylothorax complicating adult thoracic procedures[13-16], but only one has specifically dealt with the problem of chylothorax after myocardial revascularization[3]. The response to somatostatin was dramatic, allowing resumption of enteral feeding and removal of chest drains; what was even more interesting was the seemingly long-lasting effect on chyle production by somatostatin, even after it was discontinued. Whether somatostatin permanently changed the lymph dynamics or the "leaks" simply sealed themselves during the period of reduced flow needs further study.

On the other hand, the use of octreotide for chylothorax following an adult thoracic operation has been reported in only a few articles without definitive conclusions: Stringel and Teixeira[17] reported the effectiveness of octreotide administered after thoracoscopic ligation of the thoracic duct; Leelahanon et al.[18] described cases of chylothorax successfully treated with the intravenous infusion of octreotide as an adjunct to conventional treatment or as the first-line drug without diet modification; Demos et al.[19,20] reported an 80% success rate in the treatment of chylothorax with octreotide; Mikroulis et al.[21] and Stefanidis et al.[22] described cases of non-effective octreotide administration.

In our case, failing conservative therapy, we decided to administer octreotide, using the same dosage recommended by Kelly and Shumway[3]; there was a rapid response with a marked decrease in drainage production within 24 hours of starting therapy, and probably a long-lasting effect on chyle production after its discontinuation and enteral nutrition resumption.

Since it is impossible to determine the time scale of chylothorax resolution had octreotide not been used, the role of octreotide in the treatment of chylothorax cannot be established by our case report; however, its early use in conjunction with keeping patients *nil per os* and on total parenteral nutrition should increase the effectiveness of conservative management, particularly in borderline situations with moderate drainage; on the other hand, it is unlikely that it may change the clinical course if the drainage remains > 1000 ml/day and these patients may still require invasive therapy.

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