Case Report

Successful Octreotide Treatment of Chylothorax Following Coronary Artery Bypass Grafting Procedure. A Case Report and Review of the Literature

Nikolaos Barbetakis, Theocharis Xenikakis, Andreas Efstathiou, Ioannis Fessatidis

Cardiothoracic Surgery Department, Geniki Kliniki, Thessaloniki, Greece

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Chylothorax occurs in 0.25 to 0.50% of cardiac operations performed through thoracotomy incisions and is more unusual after median sternotomy. A case of chylothorax following coronary artery bypass grafting is presented. Combined treatment with pleural drainage, "nothing per os", total parenteral nutrition and subcutaneous injection of somatostatin was effective and led to rapid cessation of chyle production.

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Address:
Nikolaos Barbetakis

5-7 P. Mela St.,
55337 Thessaloniki
Greece
e-mail:
nibarb@otenet.gr

The accumulation of chyle within the pleural cavity is a rare but potentially serious and well recognised complication of thoracic surgery. Chylothorax occurs in 0.25 to 0.50% of cardiac operations performed through thoracotomy incisions and is more unusual after median sternotomy.[1] A case of chylothorax following coronary artery by pass grafting (CABG) is presented here. Combined treatment with pleural drainage, "nothing per os", total parenteral nutrition and subcutaneous injection of somatostatin was effective and led to rapid cessation of chyle production. Enteral feeding was reinstituted without complications.

Case description

A 78-year-old man was admitted to our institution with unstable angina and triple vessel coronary disease. He underwent an off-pump triple coronary artery bypass procedure with a left internal mammary artery placed to the left anterior descending and two reversed saphenous vein grafts to the first obtuse marginal branch and posterior descending artery. The left internal mammary artery was harvested as a peduncle including incision of the pleura. The operation and postoperative course were uneventful and the patient was discharged from the intensive care unit on the second postoperative day. There was no chylous drainage noted at that time. Seven days later he was discharged to home with an unremarkable chest x-ray.

On postoperative day 27, the patient returned to the clinic complaining of shortness of breath on mild exertion, anorexia and fatigue. A chest x-ray revealed a left-sided pleural effusion occupying more than two-thirds of the left hemithorax. A chest tube was inserted and 2900 ml of milky fluid were drained. After the lung had been fully expanded, the patient's respiratory symptoms improved markedly. Results of the biochemical analysis of the pleural fluid were consistent with chyle (Table 1). Sudan III staining was positive. Microbiology revealed no growth at 72 hours.

The patient was kept on a nil by mouth regimen and total parenteral nutrition (total calorie intake 1800 kcal/day) was initiat-

Table 1. Laboratory data.

	Pleural fluid	Serum
Leukocyte count (cells/mm^3)	3400	6800
Neutrophils (%)	–	58
Lymphocytes (%)	94	33
Monocytes (%)	5	4
Glucose level (mg/dl)	142	94
Total protein level (g/dl)	3.1	5.2
Cholesterol level (mg/dl)	58	194
Triglyceride level (mg/dl)	495	82

ed. He also received subcutaneous octreotide, 0.5 mg three times a day. Drainage of 500 ml of milky fluid per day persisted for the next two days and from the third to seventh day pleural fluid started to become serous and reduced drastically (<100 ml/ day). No side effects such as hypotension or hyperglycaemia were observed during the whole treatment with octreotide. By the eighth day, total parenteral nutrition and octreotide were discontinued with the chest tube in place. Complete diet was introduced gradually. Chylothorax did not recur and after five days of low output (<100 ml serous fluid/day) the chest tube was removed. Follow-up chest x-ray confirmed no reaccumulation of fluid. Three months later no recurrence of pleural effusion was detected.

Discussion

Aristotle and the anatomists Herophilos and Erasistratos are said to have described the lymphatic system in approximately 300 BC. In the 16th century Vesalius named the thoracic duct the vena alba thoracis because of the milky white fluid that it contained. Reports on chylothorax were rare before the 19th century. From the medical literature dating back to 1691, Bargebuhr compiled a review of 40 patients with non traumatic chylothorax. All had neoplasms of the abdomen and thorax. Although the first traumatic chylothorax was reported by Quinke, Zesa's review stated that Longelot in 1663 was the first to describe a traumatic chylothorax. Blalock was the first to describe this entity as a possible complication of surgery in 1936.[2]

Chylothorax is uncommon after thoracic surgical procedures. The incidence appears to be higher after oesophagectomy with mediastinal lymphadenectomy than after pulmonary resections (3% and 0.4%, respectively) and surgical ligation is often required.[3] Chylothorax after myocardial revascularisation procedures is rare, but does occur, particularly when a left internal mammary artery graft is used.[4] The aetiology of chylothorax after cardiac surgery is thought to involve disruption or dissection of the thoracic duct where it drains into the subclavian-jugular venous junction. It is due most often to branch avulsion rather than complete transection of the thoracic duct.

It can be hypothesised that lymphatic injury in patients undergoing left internal mammary artery harvesting occurs at the time of dissection performed in order to maximise the conduit's length, near the proximal end of the pedicle. Another possible cause is the disruption of collateral lymphatics, proximal to the jugular-subclavian venous junction, where they terminate in the azygos, brachiocephalic and intercostal veins. Use of electrocauterisation during left internal mammary artery harvesting is also a possible mechanism. Lymphatic control through suturing rather than through electrocauterisation is recommended, as the latter produces haemostasis by protein clot formation. As the lymph contains less cellular material and protein than the blood, this method, which is adequate for haemostasis, is less efficient in lymphatic control. Other possible aetiologies have been proposed, such as increased superior vena cava pressure due to use of tapes or to venous thrombosis during cardiopulmonary by pass.[5-7]

Twenty three cases of chylothorax after coronary artery bypass grafting were found in the literature (Table 2).[8-27] In 17 of them the left internal mammary artery was harvested. In two other patients the right internal mammary artery was also harvested. In three cases associated chylopericardium was detected, probably due to disruption of the cardiac lymphatic channels in pericardial reflections during surgery.

According to the literature, the time interval between coronary artery bypass grafting and development of chylothorax ranges from two to 90 days. However, the majority of patients were admitted to the hospital within two weeks of surgery, confirming the close relationship between surgical dissection and this complication. Chylothorax usually starts two to ten days after surgery but the initial symptoms may appear only after weeks or months. In most cases the diagnosis is not made until the patient starts a high-fat diet. In our case, the patient was admitted 57 days after surgery. His late presentation to the clinic may be due to the fact that as he became more dyspnoeic, anorexia was aggravated and slowed the pleural fluid accumulation.

The initial management of chylothorax is usually conservative and the main goals are re-expansion of the lung by drainage of chylothorax, prevention of de-

Table 2. Reported cases of chylothorax following a coronary artery bypass grafting procedure.

Author	Sex	Age	Procedure – Use of LIMA	Chyle location	Days from surgery to chylothorax onset	Treatment
Weber (1981)[8]	M	55	CABG –Yes	Mediastinum	2	Chest drainage
Kshettry (1982)[9]	M	51	CABG – No	Left hemithorax	60	Chest drainage
Di Lello (1987)[10]	M	53	CABG – Yes	Left hemithorax	3	Left thoracotomy
Zakhour (1988)[11]	M	59	CABG – Yes	Mediastinum	2	Chest drainage
Zakhour (1988)[11]	M	73	CABG – No	Left hemithorax	14	Chest drainage
Czarnecki (1988)[12]	F	61	CABG – Yes (and RIMA)	Right hemithorax	42	Right thoracotomy
Chaiyaroj (1993)[4]	F	69	CABG – Yes	Left hemithorax	6	Left thoracotomy
Bogers (1993)[13]	M	NA	CABG – Yes	Left hemithorax	NA	Left thoracotomy
Wood (1994)[14]	M	69	CABG – Yes	Left hemithorax	2	Left thoracotomy
Davies (1994)[15]	M	48	CABG – Yes	Left hemithorax	21	Left thoracotomy
Smith (1994)[16]	M	60	CABG – Yes	Left hemithorax	14	Thoracentesis
Smith (1994)[16]	M	47	CABG – Yes	Left hemithorax	7	Chest drainage
Zaidenstein (1995)[17]	F	70	CABG – No	Left hemithorax	NA	Chest drainage
Yamaguchi (1996)[18]	M	64	CABG - Yes	Left hemithorax	2	Left thoracotomy
Priebe (1999)[19]	F	75	CABG - Yes	Left hemithorax	NA	Chest drainage
Perez (1999)[20]	M	68	CABG - Yes	Left hemithorax	10	Chest drainage
Venturini (1999)[21]	M	67	CABG–Yes (and RIMA)	Left hemithorax	70	Left thoracotomy
Sharpe (1999)[22]	F	63	CABG - No	Mediastinum and left hemithorax	11	Chest and pericardial drainage
Pego-Fernandes (1999)[23]	M	38	CABG - Yes	Left hemithorax	90	Chest drainage
Brancaccio (2000)[24]	M	64	CABG - Yes	Left hemithorax	7	Chest drainage
Kelly (2000)[25]	M	77	CABG - Yes	Left hemithorax	18	Chest drainage and octreotide
Abid (2003)	NA	NA	CABG-Yes	Left hemithorax	3	Chest drainage and pleurodesis
Gabbieri (2004)	F	67	CABG-Yes	Left hemithorax	10	Chest drainage and octreotide

CABG – coronary artery bypass grafting; LIMA – left internal mammary artery; NA – not available; RIMA – right internal mammary artery.

hydration, maintenance of nutrition and reduction of chyle formation. Tube thoracostomy, total parenteral nutrition and nothing per os are the most important aspects of chylothorax management. Surgical treatment is considered only when the output remains high (>500 ml/day) despite the conservative management, or if drainage or lung expansion is incomplete. The most effective surgical approach is mass ligation of the thoracic duct at the level of the diaphragm, but at best this has an 80% success rate.[3]

The use of somatostatin as an adjunct to the conservative management of chylothorax is a relatively new concept. Somatostatin, a decatetrapeptide with numerous functions, including inhibition of hormone release, immunomodulation and neurotransmission, must be administered intravenously through continuous infusion because of its short half-life. Octreotide, its synthetic analogue, has a mild side effect profile and better pharmacokinetic properties, and can be administered subcutaneously.[28] The exact mechanism of action of octreotide in chylothorax is unclear. High affinity somatostatin receptors have been described in murine and human lymphatic tissue; therefore, it can be speculated that octreotide acts by inhibiting lymph fluid excretion in the lymphatic vessels.[29] It is also well established that octreotide reduces gastric, pancreatic and intestinal secretions. It also causes a decrease of hepatic venous pressure gradient and a mild but sustained decrease of splachnic blood flow, without influencing system haemodynamics.[30] These properties could also be useful in decreasing chyle production.

There is a satisfactory number of paediatric cardiac surgery cases where somatostatin proved its effectiveness.[31-33] It has to be mentioned that there are at least two reports where somatostatin therapy proved to be unsuccessful.[34,35] There are two cases of post-CABG chylothorax treated with octreotide.[25,27] In both of them somatostatin was instituted one week later, when total parenteral nutrition and nothing per os failed to resolve the problem. Use of octreotide led to rapid cessation of chyle production.

In our case the use of octreotide was instituted from the beginning, combined with pleural drainage, total parenteral nutrition and nothing per os. Such a therapeutic scheme applies the principles of minimising chyle formation, preventing immune deficit and maintaining adequate drainage and nutrition. Octreotide may not change the clinical course if the drainage output is high (>500 ml/day) and surgery is still required. However, the fact that this therapeutic scheme resulted in an immediate decrease in chyle production, without any side effects, makes octreotide a standard adjunct to conservative treatment.

Further controlled studies are required to confirm the effectiveness and safety of octreotide. Pleural drainage, immediate use of octreotide in conjunction with keeping patients on nothing per os and on total parenteral nutrition is definitely recommended in chylothorax management.

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