

Early Chylothorax After Coronary Artery Bypass Grafting

Feridoun Sabzi,¹ and Reza Faraji^{1,*}¹Kermanshah Cardiovascular Research Centre, Kermanshah University of Medical Sciences, Kermanshah, Iran

*Corresponding author: Reza Faraji, Kermanshah Cardiovascular Research Centre, Kermanshah University of Medical Sciences, Kermanshah, Iran. Tel: +98-9183362603, Fax: +98-8334243066, E-mail: r.faraji61@gmail.com

Received 2016 September 22; Revised 2017 June 14; Accepted 2017 July 16.

Abstract

Introduction: Post-pneumonectomy chylothorax is a very common but serious complication.**Case Presentation:** A 43-year-old male with controlled hypertriglyceridemia, underwent off-pump coronary artery bypass grafting (OPCAB) with left internal thoracic artery and three saphenous vein graft on left anterior descending artery (LAD), left circumflex and right coronary artery subsequently. Preoperative medical history was unremarkable except to severe hyper triglyceridemia that treated by gemfibrozil. The early postoperative course was complicated by chylothorax. Chest X-rays showed blunting of left costo-phrenic angle. On physical examination, a decreased respiratory sound was detected. The diagnosis of chylothorax was made by presence of milky fluid in the pleural cavity and laboratory finding of high content of triglyceride in the pleural fluid. On the following days, left pleural drainage was obtained by chest tube insertion, and low fat diet was instituted.**Conclusions:** After ten days, the milky fluid drainage of chest tube ceased, the drains were removed and the patient was discharged with normal pulmonary expansion.**Keywords:** Coronary Artery Bypass, Chylothorax, Hypertriglyceridemia

1. Introduction

Chylothorax is defined by the leakage and accumulation of lymph into the pleural cavity. This complication has several causes and be classified as neoplastic, congenital, traumatic, idiopathic, spontaneous or in post-thoracic surgery. Any procedures within the thoracic cage that associate with damage to thoracic duct or its tributaries may be associated with chylous pleural or pericardial effusion. The risk factors predicting for post CABG surgery includes left internal mammary artery (LIMA) harvesting central venous pressure (CVP) line insertion, snaring of superior vena cava (SVC), ascending aorta releasing from neighboring organs, increasing SVC pressure, postoperative thrombosis of SVC, increasing left atrial pressure, and combined atrial septal defect with pulmonary hypertension [1-3]. The careful literature, searching revealed that incidence of chylothorax following intrathoracic surgery is in the range of 0.25 to 0.50% [4, 5]. It is known that, its occurrence after CABG is extremely rare, and no case of chylothorax following OPCAB has been reported so far. We have not found any reported case of early chylous effusion after an OPCAB in patient with preoperative hypertriglyceridemia in medical literature. Therefore, we describe this extremely rare case that has some unique presentation such as occurrences after OPCAB, occurrence within three hours of an OPCAB, association with treated hypertriglyceridemia and spontaneous regression of effusion in 10th postoperative day. We exhibit not only the anatomical and

physiological basis for its occurrence, but also we suggest a new risk factor (hypertriglyceridemia) for developing of chylothorax in an old procedure (OPCAB) that renewed in recent decade.

2. Case Presentation

A 43-year-old male, with coronary artery disease (CAD), underwent angiography that showed stenosis in the left anterior descending (LAD), left marginal arteries (LCX) and right coronary artery (RCA). The patient scheduled for OPCAB and surgery performed by conventional median sternotomy. A segment of saphenous vein graft was anastomosed to the LCX and RCA sequentially and the internal thoracic artery (LIMA) was grafted to the LAD. Within three hours of ICU admission, the milky effusion (in opposed to usual blood stained effusion) was observed in left hemithorax chest bottle (500 mL in the first three day of operation, 400 mL in the 4th to 7th day of operation, 250 mL in the 8th day and 100 mL in the 9th day and 30 mL in the 10th of operation). A chest X-ray, showed pleural effusion (Figure 1). The patient was placed on a no-fat diet on the first day of operation. A puncture was made in the chest tube containing milky effusion and biochemical exam of draining fat droplets was exhibited in the Table 1. With conservative management, i.e. low fat diet and continuation of anti-hyper triglyceridemia drug, the early recovery was uneventful and milky effusion was ceased in the 10th postoperative day and the patient was discharged on 13th day

of surgery. On 3th month of follow-up, no recurrence of effusion on chest X-ray control was found. This case report has three unique features 1-occurrence after OPCAB, 2- association with treated hypertriglyceridemia, 3-early occurrences after 3 hours of operation.



Figure 1. Shows Midsternotomy and Saphenous Vein Graft Harvesting Site Incisions with Milky Effusion in Chest Bottle

Table 1. Laboratory Data

Variables	Chest Tube Fluid	Serum
Leukocyte count, cells/mm ³	4500	7600
Neutrophils, %	0	70
Lymphocytes, %	96	30
Monocytes, %	3	4
Glucose level, mg/dL	150	102
Total protein level, g/dL	2.6	5.7
Cholesterol level, mg/dL	50	167
Triglyceride level, mg/dL	2400	500

3. Discussion

There are many etiology, such as LIMA, RIMA harvesting, thymus handing, aortic arch surgery, snaring of SVC or IVC, mitral stenosis, ASD surgery, pulmonary hypertension and others rare causes, that may be followed by chylothorax in cardiac surgery [4, 5]. Incidence of chylothorax after CABG is a few and in addition, our case is the only one of twenty six of other cases of chylothorax following CABG that have been found in the medical literature. None of them occurred after OPCAB. Another unique feature of this complication is time of occurrence within 3 hours that it's very surprising as first few hours drainage

will be blood or blood stained. Usually suspicion arises after 24 hours observing milky copious drainage. It's very unusual finding. If we consider huge number of CABG that performed in the cardiac surgery centers in the world, reported cases of chylothorax is an exceptional complication. The rarity of this complication in OPCAB could be explained by lower chance of injury to the thoracic duct in this type of surgery. In opposed to OPCAB surgery some additional procedures may be performed in on-pump such as, snaring of SVC, handling of ascending aorta, aortic cross clamping that may be associated with thoracic duct injury [6]. Other possible etiologies have been proposed, such as increased superior vena cava pressure due to use of tapes or to venous thrombosis during cardiopulmonary bypass. Location of the thoracic duct in the superior mediastinum close to SVC, ascending aorta, aortic arch and to the left subclavian artery predispose it to a traumatic injury during CABG. In addition, injury to large branch of thoracic duct may be occurred during dissection of thymus or LIMA harvesting close to subclavian artery. Another procedure that may be associated with injury to thoracic duct is insertion of central venous pressure line from left internal jugular vein. In the neck, thoracic duct has an upward curved course and after downward rotation, posterior to the first portion of the left subclavian artery, it joined to the left internal jugular vein that may be injured by repeated trauma of CVP line insertion [7]. During OPCAB, lymphatic ducts may be injured in the region of the thymus or near the origin of the internal thoracic artery, which is destination site of thoracic duct during harvesting of LIMA. In other hand LIMA has a rich collateral network of lymphatic ducts that originated from inter costal lymphatic chain. These collateral chains due to congenital abnormality may become more prominent in some patients. In addition, abnormal course of thoracic duct has been documented in more than fifty percent of patients. Some patients have two thoracic duct with mirror images map that may end at their course to the hemi azygous, azygous, innominate, intercostal veins, and the subclavian-jugular venous junction. The most important procedure during OPCAB that may lead to thoracic duct injury is LIMA harvesting [8]. lymphatic collateral and its tributaries not only have close proximity to destination site of thoracic duct in the origin of LIMA but also receive many collaterals lymphatic chain from inter costal network that may injured during harvesting. Another risk factor of chylothorax during harvesting of LIMA is electrocauterization. In opposed to blood vessels that electrocautery by coagulation of blood protein led to hemostasis, in lymphatic with low content of protein, electrocautery burns intra lymphatic lipids and blow up them and ending in lymph leakage. In opposed to others case reports that Chylothorax

usually started to drainage some days after surgery when oral intake begins or fatty meal served, in our case the initial symptoms was appeared within three hours of surgery. This sudden beginning of chylous effusion in ours patient explained by severe hyperlipidemia. Despite preoperative management of hyperlipidemia by related drugs, the patients fasting serum triglyceride level was 250 mg/dL. Hyperlipidemia has a role of fatty meal that causes early confession of lymph leak in postoperative periods. The most common sign of chylothorax is blunting of costo-phernic angle or mediastinal widening. Mild case of chylothorax has not brilliant sign and symptom, however in moderate to server cases, dyspnea, orthopnea, fever, weight and appétit loss occurred. Laboratory exam of milky fluid revealed high content of fat that may associates with presence of pancreatic lipase, amylase and deoxyribonuclease. Peripheral smear of lymph also shows free fat in microscopic exam. Lymphocytes are the main cellular component of lymph by in the range of 5,000 per mm². The Red blood cells content will be low and theirs range could be between 20 - 50 cells per mm². The initial treatment of chylothorax is conservative approach, to minimize chyle formation, to prevent the immune deficiency, and to maintain adequate drainage as well as to replace a high-fat diet with high content protein diet which is absorbed directly in the portal system without passing through the thoracic duct [9-12]. If the drainage remains high in spite of therapy, total parenteral nutrition must be indicated. Surgical intervention will be considered only if there is incomplete drainage or continuous loss of chyle. The early surgical treatment of voluminous leakage is indicated when adhesion is not widespread but when surgical approach was delayed a plentiful fibrinous adhesion prevent easy finding of leakage site. In this case, pleural cleaning and pleurodesis is a good choice. In an anatomical study, Riquet et al. reported that LIMA dissection close to the left anterior mediastinal lymph node chain caused injury to these chain and leakage to thorax [13]. Like to peripheral vein, lymph vessels have valve and lymph back-flow is impossible during proximal injury to these lymph chains. Congenital lymph valve insufficiency, another cause of post-surgical chylothorax is very rare phenomenon and was not reported in post CABG so far. Another cause of thoracic duct injury is surgeon try to maximize the conduit's length near the proximal end of the LIMA pedicle [14, 15]. In conclusion, preoperative hyper triglyceridemia treatment is an important tools for avoiding, chylothorax occurrences in post OPCAB period. However as a rare complication after OPCAB, like our case, where the early diagnosis was made, hyperlipidemia treatment by drugs is extremely useful, because it is an efficient and less invasive method which allows for rapid reducing of chyle volume. A careful diet is

essential for a good clinical outcome.

Footnotes

Authors' Contribution: All authors contributed equally to this work.

Conflict of Interest: The authors declare no conflict of interest.

References

1. Kanakis MA, Misthos P, Kokotsakis JN, Lioulis AG. Chylothorax complicating thoracic aortic surgery. *J Card Surg.* 2011;**26**(4):410-4. doi: [10.1111/j.1540-8191.2011.01280.x](https://doi.org/10.1111/j.1540-8191.2011.01280.x). [PubMed: [21793930](https://pubmed.ncbi.nlm.nih.gov/21793930/)].
2. Chalret du Rieu M, Baulieux J, Rode A, Mabrut JY. Management of postoperative chylothorax. *J Visc Surg.* 2011;**148**(5):e346-52. doi: [10.1016/j.jviscsurg.2011.09.006](https://doi.org/10.1016/j.jviscsurg.2011.09.006). [PubMed: [22033151](https://pubmed.ncbi.nlm.nih.gov/22033151/)].
3. Sersar SI. Predictors of prolonged drainage of chylothorax after cardiac surgery: single centre study. *Pediatr Surg Int.* 2011;**27**(8):811-5. doi: [10.1007/s00383-011-2890-8](https://doi.org/10.1007/s00383-011-2890-8). [PubMed: [21660449](https://pubmed.ncbi.nlm.nih.gov/21660449/)].
4. Halldorsson A. Chylothorax after coronary artery bypass grafting. *Int Surg.* 2009;**94**(2):119-29. [PubMed: [20108614](https://pubmed.ncbi.nlm.nih.gov/20108614/)].
5. Choong CK, Martinez C, Barner HB. Chylothorax after internal thoracic artery harvest. *Ann Thorac Surg.* 2006;**81**(4):1507-9. doi: [10.1016/j.athoracsur.2005.02.045](https://doi.org/10.1016/j.athoracsur.2005.02.045). [PubMed: [16564309](https://pubmed.ncbi.nlm.nih.gov/16564309/)].
6. Falode O, Hunt I, Young CP. Chylothorax after coronary artery bypass surgery. *J R Soc Med.* 2005;**98**(7):314-5. doi: [10.1258/jrsm.98.7.314](https://doi.org/10.1258/jrsm.98.7.314). [PubMed: [15994593](https://pubmed.ncbi.nlm.nih.gov/15994593/)].
7. Sachithanandan A, Nanjiaiah P, Rooney SJ, Rajesh PB. Idiopathic primary chylopericardium with associated chylothorax following coronary artery surgery-successful conservative treatment. *J Card Surg.* 2008;**23**(3):258-9. doi: [10.1111/j.1540-8191.2007.00521.x](https://doi.org/10.1111/j.1540-8191.2007.00521.x). [PubMed: [18435645](https://pubmed.ncbi.nlm.nih.gov/18435645/)].
8. Misthos P, Kanakis MA, Lioulis AG. Chylothorax complicating thoracic surgery: conservative or early surgical management? *Updates Surg.* 2012;**64**(1):5-11. doi: [10.1007/s13304-012-0133-8](https://doi.org/10.1007/s13304-012-0133-8). [PubMed: [22241168](https://pubmed.ncbi.nlm.nih.gov/22241168/)].
9. Brancaccio G, Prifti E, Cricco AM, Totaro M, Antonazzo A, Miraldi F. Chylothorax: a complication after internal thoracic artery harvesting. *Ital Heart J.* 2001;**2**(7):559-62. [PubMed: [11501967](https://pubmed.ncbi.nlm.nih.gov/11501967/)].
10. Abid Q, Millner RW. Chylothorax following coronary bypass grafting: treatment by talc pleurodesis. *Asian Cardiovasc Thorac Ann.* 2003;**11**(4):355-6. doi: [10.1177/021849230301100420](https://doi.org/10.1177/021849230301100420). [PubMed: [14681102](https://pubmed.ncbi.nlm.nih.gov/14681102/)].
11. Charniot JC, Zerhouni K, Kambouchner M, Martinod E, Vignat N, Azorin J, et al. Persistent symptomatic pleural effusion following coronary bypass surgery: clinical and histologic features, and treatment. *Heart Vessels.* 2007;**22**(1):16-20. doi: [10.1007/s00380-006-0930-4](https://doi.org/10.1007/s00380-006-0930-4). [PubMed: [17285440](https://pubmed.ncbi.nlm.nih.gov/17285440/)].
12. Light RW, Rogers JT, Moyers JP, Lee YC, Rodriguez RM, Alford WJ, et al. Prevalence and clinical course of pleural effusions at 30 days after coronary artery and cardiac surgery. *Am J Respir Crit Care Med.* 2002;**166**(12 Pt 1):1567-71. doi: [10.1164/rccm.200203-184OC](https://doi.org/10.1164/rccm.200203-184OC). [PubMed: [12406850](https://pubmed.ncbi.nlm.nih.gov/12406850/)].
13. Riquet M, Assouad J, D'Attellis N, Gandjbakhch I. Chylothorax and re-expansion pulmonary edema following myocardial revascularization: role of lymph vessel insufficiency. *Interact Cardiovasc Thorac Surg.* 2004;**3**(3):423-5. doi: [10.1016/j.icvts.2004.03.001](https://doi.org/10.1016/j.icvts.2004.03.001). [PubMed: [17670279](https://pubmed.ncbi.nlm.nih.gov/17670279/)].
14. Deguchi K, Yamauchi T, Maeda S, Takeuchi M, Kin K, Takano H. Chylothorax after coronary artery bypass grafting using the right internal thoracic artery. *Gen Thorac Cardiovasc Surg.* 2015;**63**(7):416-21. doi: [10.1007/s11748-013-0303-8](https://doi.org/10.1007/s11748-013-0303-8). [PubMed: [23921965](https://pubmed.ncbi.nlm.nih.gov/23921965/)].

15. Szabo M, Jager M, Krizso E, Gilanyi I, Leny A, Szucs G, et al. [Chylothorax as a complication of coronary artery bypass grafting operation]. *Orv Hetil.* 2012;**153**(14):553-8. doi: [10.1556/OH.2012.29341](https://doi.org/10.1556/OH.2012.29341). [PubMed: [22450144](https://pubmed.ncbi.nlm.nih.gov/22450144/)].