

## Chylous accumulation in the mediastinal space following coronary artery bypass graft surgery

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### ARTICLE INFORMATION

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### Competing interests

The authors declare no competing interests

### Abbreviations

CPB: cardiopulmonary bypass

### ABSTRACT

*Chylomediastinum as a complication of cardiovascular surgery has a reported incidence of lower than 0,5% and is extremely rare following intrapericardial procedures. The origin of this complication is a direct injury to the anterior mediastinum lymphatics in the thymus area or the thoracic duct, at the junction of the left jugular and subclavian veins, obstructing thoracic duct drainage. Firstly, conservative treatment with low fat and medium chain triglyceride diet is preferred by cutting oral feeding. If the drainage persists despite 2 weeks of conservative treatment, the surgical ligation of the ductus thoracicus may be considered for the management of this complication. We present the mediastinal chylous fluid accumulation in a male patient who underwent revision due to bleeding on postoperative second day after coronary artery bypass surgery.*

**Keywords:** Chylomediastinum, Coronary artery bypass grafting, Parenteral nutrition, Cardiac surgery, Complications

### *Acumulación quilosa en el espacio mediastínico después de una revascularización miocárdica quirúrgica*

### RESUMEN

El quilomediastino como complicación de la cirugía cardiovascular tiene una incidencia de menos del 0,5% y es extremadamente raro después de los procedimientos intrapericárdicos. El origen de esta complicación es una lesión directa en los vasos linfáticos del mediastino anterior, en el área del timo o el conducto torácico, en la unión de las venas yugular izquierda y subclavia, que obstruye el drenaje del conducto torácico. En principio se prefiere el tratamiento conservador con suspensión de la vía oral y la administración parenteral de una dieta baja en grasas y triglicéridos de cadena media. Si el drenaje persiste después de 2 semanas de tratamiento conservador, debe considerarse la ligadura quirúrgica del ductus torácico como tratamiento de esta complicación. Se presenta un caso de un hombre que presentó acumulación mediastínica de líquido quiloso, tras una reintervención por sangrado en el segundo día del posoperatorio de una revascularización miocárdica quirúrgica.

**Palabras clave:** Quilomediastino, Revascularización miocárdica quirúrgica, Nutrición Parenteral, Cirugía cardíaca, Complicaciones

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### INTRODUCTION

Chylomediastinum is an unusual cause of pericardial effusion<sup>1</sup>, first de-

in 1971 by Thomas and McGoon<sup>2</sup>. Uncontrolled leakage of lymph can cause hypoproteinaemia, malnutrition, immune deficiency, infections and life-threatening cardiac complications such as constrictive pericarditis or cardiac tamponade<sup>1,2</sup>. In addition to congenital cardiac and thoracic surgery, it has been reported to be seen after valve replacements and myocardial revascularization<sup>3</sup>. Besides macroscopic appearance, biochemical and histological studies can be easily diagnosed. In this article, a patient successfully treated with conservative treatment was presented.

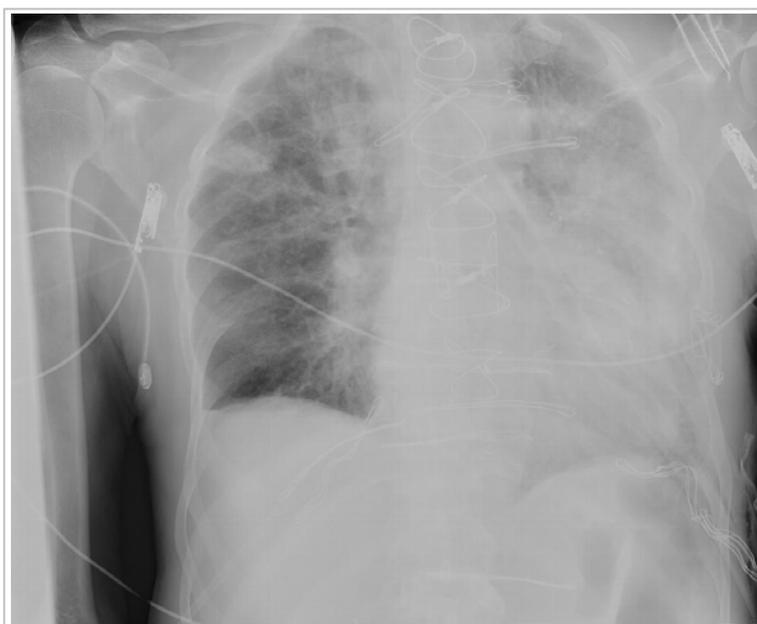
## CASE REPORT

A 61-year-old male patient was admitted to our hospital with complaints of dyspnea and chest pain for 1 year. The full blood count and blood chemistry were normal, and urine analysis showed normal results. There was no pathological finding on physical examination except for hypertension. His electrocardiogram showed normal sinus rhythm, with T-wave abnormality. Echocardiography showed ejection fraction of 55% and a normal valve function.

Coronary angiography revealed multivessel disease, and coronary artery bypass surgery was decided. After sternotomy, the thymus was not excised, but the isthmus was split in the midline by electrocautery as in every patient. Before cardiopulmonary bypass (CPB) was initiated, heparin sodium was administered at an initial dose of 300 IU/kg. CPB was instituted by using ascending aortic cannulation and a two-stage venous cannulation in the right atrium. In order to insert the cross clamp, the cross clamp site was created by dissection between the ascending aorta and the pulmonary artery. The myocardial protection was achieved with intermittent antegrade and retrograde blood cardioplegia (Custodiol®, Alsbach-Hahnlein, Germany). Mean arterial pressure was maintained between 50 and 70 mmHg. The systemic temperature was maintained between 30 and 34°C. The patient underwent four-vessel coronary bypass surgery, the aortic cross-clamp was removed and the proximal anastomoses were performed with partial clamping.

After the patient was weaned from CPB and decannulated, heparin was completely neutralized using protamine (1/1.5 rate; Valeant, Eschborn, Germany). There were no intraoperative complications. Epicardial pacemaker wires were inserted on the surface of the right ventricle for the heart rate manipulations. At the end of the operation, one drain was placed in the mediastinum and thorax cavity.

The patient had approximately 1200 cc hemorrhagic drainage in the first 24 hours in intensive care. The amount of drainage was reduced as a result of blood and fresh frozen plasma replacement. Despite the absence of hemodynamic instability, there was hematoma in the left thoracic cavity and enlarged cardiac silhouette in chest radiography on the 2nd day (**Fig. 1**). Besides, echocardiography showed a large pericardial effusion, which was 1 cm around left ventricle and 2 cm around right atrium and right ventricle. Although there was no evidence of cardiac tamponade, we decided to revise the patient in order to control hemorrhage and to evacuate the hematoma. The wires of sternotomy were removed and mediastinal area opened again. The intensely organized hematoma were evacuated from the mediastinal site and the left thoracic cavity. In addition, blood clots accumulated back of the heart, and surrounding superior vena cava and innominate



**Fig. 1.** Telecardiogram showing mediastinal enlargement and hematoma in the left hemithorax due to bleeding after coronary artery bypass surgery.



**Fig. 2.** Chylous drainage following oral nutrition after revision for bleeding.

venous tract were cleared. The leak in the proximal anastomosis of the aorta-saphenous graft was repaired. The operation was completed by washing the mediastinal area and placing a new drain. No significant hemorrhagic drainage was detected after revision.

The color of the liquid in the drains turned serous and oral fluid feeding started on the third day. On the following day, oral solid foods were passed, but serous fluid in the mediastinal drain began to increase at the end of the fifth day. The same day the appearance of this liquid turned milky white fluid (**Fig. 2**). On the 6th day postoperatively, there was 1600 cc drainage in milk color and yellowish. The fluid samples were taken from the mediastinal drainage and biochemical and microbiological examinations were performed. Liquid triglyceride level was 1825 mg/dL, total protein level 6,5 mg/dL, and cholesterol 211 mg/dL. No infiltration with microorganisms or polymorphonuclear leukocytes infiltration was observed, which verified chylous fluid.

The oral feeding of the patient was discontinued, and total parenteral feeding with a low fat and medium chain triglyceride diet was initiated. Somatostatin could not be given to the patient because it was not found. The volume of fluid drained decreased progressively from about 1600 ml on the day after parenteral nutrition to 50 ml eleven days later. Drainage ceased after twelfth day, and me-

diastinal draine was removed on 13th day. Since drainage stopped, no surgical intervention was needed. Postoperative chest radiography and echocardiography confirmed no re-accumulation of mediastinal fluid and the patient was discharged on the 17th day. An echocardiograph 2 week later showed no fluid in the mediastinal space. Three months after surgery, he had no signs of effusion and remained asymptomatic.

#### Consent

Written informed consent was obtained from the patient's family for obtaining the pictures, and from the patient itself for publication of this case report and any accompanying images.

#### COMMENTS

Mediastinal chylous accumulation, which can be occur after cardiac surgery, is seen in 0.2 % to 0.5 % and can be catastrophic if untreated<sup>4</sup>. Even if the cause is not exactly known, it may be congenital or acquired. In addition to mediastinal lymphoma, trauma, valvular thrombosis, cardiac operations, most cases have been associated with surgery for congenital heart disease<sup>5</sup>.

The aetiology of postoperative chylomediastinum is still obscure. The main pathology is obstructions related to ductus thoracicus and branches. The common etiology of chylous accumulation in the mediastinal space are the injury of the cardiac and pericardial small lymphatic cannals during the surgical procedure. Chyle is the normal content of lacteals and the thoracic duct. The thoracic duct originates as the cisterna chyli below the diaphragm in the region of the lumbar vertebrae. It ascends in the right hemithorax between the aorta and the azygos vein. It crosses to the left, passes behind the aortic arch, and drains at the junction of the left jugular and left subclavian veins. Various tributaries of lymphatic fluid from thymic tissue, pericardial reflections, and pretracheal lymph nodes drain into the thoracic duct<sup>6,7</sup>. There are also right and left bronchomediastinal lymphatic channels opening separately to the right and left brachiocephalic venules. The lymphatic channels, as result of the chest wall's extreme retraction result ductus thoracicus, may be damaged, also lymphatic leaks may

also occur as a consequence of the injuries of the inferior caval lymphatic ducts during cannulation of the inferior vena cava. It can be seen as a complication of exploratory procedures for preparing the operation for the patient or during cross clamp placement. Thymus, pericardium and thyroid gland are tributaries of brachiocephalic lymph nodes, which are located in this region. The thymus, lymphatic channels around, may be damaged during surgical exploration. Generally, traction on the duct from manipulation of the heart and great vessels, thrombosis at the junction of the left jugular and subclavian veins that obstructs thoracic duct drainage, and the development of connections between the pericardial sac and a lymphatic leak can contribute to postoperative chylopericardium<sup>6, 8</sup>. Electrocautery may be an unreliable means of control as the thin lymphatic walls contains little coagulable material. This problem can be prevented by surgical ligation of the thymic vascular structures at the time of dissection rather than the use of electrocautery. Thus, the thymus lobes should be separated by blunt dissection and ligated with sturdy sutures<sup>9</sup>.

Chylous drainage can occur early or late following cardiac surgery. Early chylopericardium is characterized by progressive serous drainage, and after starting oral feeding, the drainage becomes milky white fluid. In late-onset chylopericardium, cardiac silhouette enlargement, cardiac tamponade findings, fullness in the neck veins and palpable liver findings occur. This emergence period may occur between the 1st postoperative day and the post-discharge period. In our patient, after oral feeding started, serous drainage was increased first, and then the liquid's character was turned into chylous structure. In our patient, the mediastinal site was opened twice because of bleeding. In addition to the initial surgical trauma, bleeding control and hematoma clearing may have damaged the lymphatic structures and small cannals around the thymus, innominate vein and vena cava.

In addition to macroscopically milky white odorless liquid, biochemical and microbiological tests also play an important role in diagnosis. In pericardial fluid sample: milky liquid has a total cholesterol level greater than 110 mg/dL, and a triglyceride level greater than 500 mg/dL. Although the total cholesterol levels in our patient were not high, the triglyceride level and appearance of the fluid were consistent with chylopericardium. The negative fluid culture and prominent lymphocytes supported the

diagnosis<sup>5,9</sup>. Besides, the presence of fat globules obtained by Sudan III staining of the drainage fluid helps in the diagnosis of chylous fluid<sup>9</sup>. In cases of late-onset chylopericardium; as a result of clinical findings, telecardiogram, and echocardiographic data showing pericardial effusion, differential diagnosis should be made, and liquid samples should be taken by pericardiocentesis. Our patient was a case of a chylopericardium seen in the early postoperative period. Diagnosis of chylopericardium was easily macroscopically diagnosed and biochemically and microbiologically supported.

There are some disagreements about postoperative chylopericardium treatment. Initial treatment of chylopericardium is generally conservative, consisting of pericardiocentesis, dietary manipulation, and infusion of somatostatin<sup>6</sup>. Although many surgeons have suggested ligation of ductus thoracicus in the first priority, conservative treatment with parenteral feeding with low-fat and medium-chain triglycerides in addition to drainage has also been shown to be effective<sup>10,11</sup>. In patients who do not respond to conservative treatment, the ligation and resection of the thoracic duct just above the diaphragm have proved to be the most effective treatment<sup>12-14</sup>. We do not allow oral feeding from the detection of chylous drainage in our case. We passed total parenteral nutrition (low-fat and medium-chain triglycerides) and gave the patient an albumin infusion to prevent protein loss. On the 12th postoperative day, after the drainage ceased, we passed the oral feeding again and on the 13th day we took the patient's drain off. The cardiac silhouette was not enlarged in the telecardiogram and no mediastinal fluid was detected by echocardiogram.

## CONCLUSIONS

We presented a rare case of chylopericardium in a patient who underwent coronary bypass surgery with median sternotomy in this article. Mediastinal tissues should be protected as much as possible and no damage should be performed to the lymphatic structure and cannals when the patient is prepared for surgery after sternotomy. If a chylous drainage is detected, cut off oral feeding, fluid electrolyte replacement with intravenous parenteral nutrition and a diet low in fat and high in medium-chain triglycerides can help to resolve the effusion. If further production of chylous effusion continues, surgical treatment is mandatory and usually curative.

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