Chylothorax after Myocardial Revascularization with the Left Internal Thoracic Artery

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A 38-year-old male underwent coronary artery bypass grafting (CABG). A saphenous vein graft was attached to the left marginal branch. The left internal thoracic artery was anastomosed to the left anterior descending artery (LAD). The early recovery was uneventful and the patient was discharged on the 5th postoperative day. After three months, he came back to the hospital complaining of weight loss, weakness, and dyspnea on mild exertion. Chest X-rays showed left pleural effusion. On physical examination, a decreased vesicular murmur was detected. After six days, the diagnosis of chylothorax was made after a milky fluid was detected in the pleural cavity and total pulmonary expansion did not occur. On the next day, both anterior and posterior pleural drainage were performed by videothoracoscopy, and prolonged parenteral nutrition (PPN) was instituted for ten days. After seven days the patient was put on a low-fat diet for 8 days. The fluid accumulation ceased, the drains were removed and the patient was discharged with normal pulmonary expansion.

Chylothorax is characterized by the leakage of chyle into the pleural cavity. This condition may have several etiologies and be classified as congenital, traumatic, obstructed or spontaneous.

The first posttrauma chylothorax was reported by Quinke in 1875, but it was Blalock who first described this entity as a complication of surgery in 1936.

The Chylothorax is a recognized complication of intrathoracic surgery with an incidence of 0.25 to 0.50% reported in the international literature. On the other hand, its occurrence after CABG is extremely rare.

We haven’t found any report of chylothorax as a complication of CABG in the Brazilian medical literature. Therefore, we describe this case to alert cardiovascular surgeons to the possibility of the occurrence of this kind of complication. We describe the anatomical basis that allows for its development, as well as suggestions for preventing and treating this condition, thus reducing possible damage to the patients.
Discussion

There are many surgical interventions, such as cardiovascular, pleuropulmonary and mediastinal surgeries, among others, that may be followed by chylothorax.

In addition to ours, only ten other cases of chylothorax following CABG have been described in the medical literature 8 (table I), indicating that chylothorax is a rare complication of CABG with the left internal thoracic artery 4-8.

The rarity of this complication can be explained by the location of the thoracic duct. The thoracic duct is located in the superior mediastinum, to the left of the posterior wall of the esophagus, close to the aortic arch and to the left subclavian artery. In the neck, it has a lateral ascending course and an inferior rotation behind the first portion of the left subclavian artery where it connects to the left internal jugular vein. During CABG, lymphatic channels may be disrupted in the region of the thymus or near the origin of the internal thoracic artery, which is taken out as part of the operative procedure.

However, this normal course of the thoracic duct is found in only half of the cases; the variable embryonic development causes 40 to 60% of the individuals to have two or more ducts 4-8. Moreover, lymphatic collaterals end at the azygous, brachiocephalic, and intercostal veins, near the subclavian - jugular venous junction. Due to the great proximity of the lymphatic tributaries to the origin of the left internal thoracic artery, in part of the left subclavian artery, these lymphatics can be injured during manipulation. A thoracic duct pressure of 7.0 to 20.0mmHg was measured and may reflect in the pressure in the lymphatic tributaries, causing the chylous leak, if the vessel is damaged.

The cause of chylothorax is not known in many cases, as the conservative therapy can usually control the leakage successfully 5,6.

There are a few cases where the origin of the leakage can be identified. For example, electrocauterization used in surgery damages primary lymphatics. Lymphatic control through suturing rather than through electro-
Table I - Reported cases in the literature of chylothorax as a complication of CABG through classical sternotomy

<table>
<thead>
<tr>
<th>Author</th>
<th>Date</th>
<th>Sex</th>
<th>Age (years)</th>
<th>Procedure</th>
<th>Chyle Location</th>
<th>Chyle onset after operation (days)</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weber</td>
<td>1981</td>
<td>M</td>
<td>55</td>
<td>CABG</td>
<td>Mediastinum</td>
<td>2</td>
<td>Closed-chest drainage</td>
</tr>
<tr>
<td>Kshettry</td>
<td>1982</td>
<td>M</td>
<td>51</td>
<td>CABG</td>
<td>Left side of chest</td>
<td>60</td>
<td>Closed-chest drainage</td>
</tr>
<tr>
<td>Teba</td>
<td>1985</td>
<td>F</td>
<td>51</td>
<td>CABG</td>
<td>Left side of chest</td>
<td>3</td>
<td>Closed-chest drainage</td>
</tr>
<tr>
<td>Dilello</td>
<td>1987</td>
<td>M</td>
<td>53</td>
<td>CABG</td>
<td>Left side of chest</td>
<td>6</td>
<td>Left thoracotomy and intraoperative fibrin glue</td>
</tr>
<tr>
<td>Zakhour</td>
<td>1988</td>
<td>M</td>
<td>59</td>
<td>CABG</td>
<td>Mediastinum</td>
<td>2</td>
<td>Closed-chest drainage</td>
</tr>
<tr>
<td>Zakhour</td>
<td>1988</td>
<td>M</td>
<td>73</td>
<td>CABG</td>
<td>Left side of chest</td>
<td>14</td>
<td>Closed-chest drainage</td>
</tr>
<tr>
<td>Czarnecki</td>
<td>1988</td>
<td>F</td>
<td>61</td>
<td>CABG</td>
<td>Right side of chest</td>
<td>42</td>
<td>Right thoracotomy and lymphatics ligation</td>
</tr>
<tr>
<td>Chaiyaroj</td>
<td>1993</td>
<td>F</td>
<td>69</td>
<td>CABG</td>
<td>Left side of chest</td>
<td>6</td>
<td>Left thoracotomy and lymphatics ligation</td>
</tr>
<tr>
<td>Smith</td>
<td>1994</td>
<td>M</td>
<td>60</td>
<td>CABG</td>
<td>Left side of chest</td>
<td>14</td>
<td>Thoracentesis</td>
</tr>
<tr>
<td>Smith</td>
<td>1994</td>
<td>M</td>
<td>47</td>
<td>CABG</td>
<td>Left side of chest</td>
<td>7</td>
<td>Open drainage</td>
</tr>
<tr>
<td>Relato em questão</td>
<td>1994</td>
<td>M</td>
<td>38</td>
<td>CABG</td>
<td>Left side of chest</td>
<td>91</td>
<td>Videothoracoscopy and closed-chest drainage</td>
</tr>
</tbody>
</table>

Cauterization is recommended as the latter produces hemo-
mostasis by the protein clot formation. As the lymph
contains less cellular material and protein than the blood,
this method, which is adequate for hemostasis, is less
efficient in lymphatic control.

Chylothorax usually starts two to ten days after surge-
ry, 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. Frequently, the drain is still in
place when the adult patient begins oral intake of food, and
an early diagnosis can be made, when the chyle becomes
cloudy after the patient has eaten.

If an early diagnosis is not made, the first indication of
chylothorax is initially seen as a mediastinum enlargement
in the chest X-ray, and afterwards, as pleural effusion.
Symptoms can be weight loss, loss of appetite and persist-
tent low fever; although, in some cases, the patient is not se-
en until circulatory shock and severe respiratory distress
have occurred. Hypoalbuminemia or hypoglobulinemia are
usually found.

Thoracentesis and milky fluid microscopical evalua-
tion will reveal the presence of free fat. Fatty content will be
higher in the milky fluid than in plasma, provided that pro-
tein content is around half of that in the plasma. Pancreatic li-
pase, amylase and deoxyribonuclease will be present

Because they reach the blood via thoracic duct. The
main cellular component is represented by lymphocytes in
the range of 4,000 to 6,000 per mm². The Red blood cells will
be in levels lower than 50 cells per mm². In cases diagnosed early, the initial management of
chylothorax is usually conservative, 2–9 and the main goals are to minimize chyle formation, to prevent the immune defi-
ciency, and to maintain adequate drainage as well as to re-
place a high-fat diet with MCT, 2–5 which are absorbed direc-
tly in the portal system without passing through the thor-
acic duct. If the drainage remains high in spite of therapy,
total parenteral nutrition must be indicated.

In these cases, surgical intervention will be considered
only if there is incomplete drainage or continuous loss of chyle.

On the other hand, in cases like ours, where the postin-
terventional diagnosis of surgical chylothorax was delayed,
a fibrinous clot and its adhesions made the search impossible.
Even when the damaged duct is ligated, the possibility of leakage remains, either because of incomplete occlusion
or due to the presence of other lymphatic channels. Pleuro-
desis is indicated in these cases 13,14. In our patient, due to
the inadequate lung expansion and to the late diagnosis,
exploratory videothoracoscopy was used. Surgical adhesi-
ons made the duct exploration a high-risk procedure and,
therefore, we opted for pleural cleaning and for pleurodesis.

In conclusion, prevention is the best method for avoi-
ding chylothorax. It is a rare complication after CABG. In
cases like ours, where the diagnosis was late, videothoraco-
scopy is extremely useful, because it is an efficient and
less invasive method which allows for adequate pleurode-
sis. A careful diet is essential for a good clinical outcome.
References