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Postoperative chylothorax: Choosing the correct patient for early surgery at the correct time

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Abstract
Postoperative chylothorax is a serious complication increasing rates of both mortality and morbidity in patients who undergo thoracic surgery. A total of 41 patients with the diagnosis of postoperative chylothorax were divided into four groups considering the initial amount of chylous drainage per day: Group A (n=25, <200 mL), Group B (n=9, 200-500 mL),Group C (n=6, 500-1000 mL) and Group D (n=1, >1000 mL). All of the patient groups were examined in terms of duration of chylous drainage, treatment method, type of correction surgery and length of hospital stay. Conservative treatment was adequate for the patients in Group A and B, whereas we performed 2 thoracoscopies and 4 thoracotomies for Group C and one thoracotomy for the patient in Group D. Re-surgery via thoracotomy included thoracic duct ligation for 3 and mass ligation for 2 patients, whereas thoracoscopic correction was achieved by mass ligation for the remaining two cases. As a conclusion, we suggest that surgery shall be considered for the patients with deterioration in status or for whom developing drain output of 500 to 1000 mL for at most 8 days or more than 1000 mL in 24 hours after the initial operation.

Keywords: postoperative Chylothorax, complication, early surgery, thoracoscopy

Introduction
Chylothorax is defined as the presence of chyle in the pleural space, causing serious consequences as malnutrition, immunodeficiency, hyponatremia, hypoproteinemia and heart failure that may contribute to sepsis. It may increase mortality rate in nearly 30% of patients. Most common causes for postoperative chylothorax in thoracic surgery include esophageal surgery, pulmonary resection and lymph node dissection [1].

Postoperative chylothorax, resulting from the injury to the thoracic duct, is rare with a reported incidence ranging from 0.5% to 6.5% [2]. It mostly occurs on the right side, relating the localization of the thoracic duct [3]. Diagnosis becomes absolute with the appearance of milky or less typically bloody pleural drainage; elevated level of triglycerides (>110 mg/dL) and the presence of chylomicrons in the pleural fluid. Treatment modalities range from dietary modification (low-fat diet or total parenteral nutrition), pharmacological treatment (e.g. somatostatin analogue, pancreatic lipase inhibitor), interventional radiological procedures (e.g. percutaneous thoracic duct embolization) to surgical repair [4-9].

The optimal management strategy still remains controversial because of the rarity of the situation and insufficient number of prospective studies. Herein, we report our experience in the management of postoperative chylothorax in our institution.

Materials and methods
We conducted a retrospective study to clarify the treatment methods in patients with the diagnosis of chylothorax. A total of 41 patients with the diagnosis of chylothorax following 1172 pulmonary resections, 273 chest wall resections, 203 pleurectomies and 422 thymectomies in Istanbul University Faculty of Medicine between April 2002 and May 2017 were included in the study. All cases had chylous drainage from the chest tube and high levels of triglycerides (>110 mg/dL) in the pleural fluid.

The patients were divided into four groups considering the initial amount of chylous drainage per day: Group A (n=25, <200 mL), Group B (n=9, 200-500 mL), Group C (n=6, 500-1000 mL) and Group D (n=1, >1000 mL). The patients in Group A and B were treated conservatively with oral intake cessation and total parenteral nutrition (TPN) while the patients in Group C and D needed surgical intervention for treatment.

All of the patient groups were examined in terms of duration of chylous drainage, treatment method, type of correction surgery and length of hospital stay. Duration of chylous drainage was the period between primary surgery and chest tube removal or re-operation. Treatment method was recorded as conservative treatment or re-surgery. Type of correction surgery was subgrouped as interventions via thoracotomy or thoracoscopy (VATS). Hospital stay revealed the time needed to discharge patients and was also calculated separately for cases who underwent re-operation. Amount of chylous drainage was noted daily and biochemical status was closely monitorized with the follow up of electrolyte and serum protein levels. TPN was administrated to all of the patients undertaking conservative treatment. Cases who underwent correction surgery were allowed to oral nutrition at postoperative day 2 unless they had chylous drainage.

Results
We have 27 male (65.8%) and 14 female patients (34.2%)

with a median age of 45.5 years (range: 6-73). Incidence of postoperative chylothorax was 1.98% in our series. A total of 26 patients underwent lobectomy and 3 pneumonectomy via thoracotomy, 6 lobectomy and 1 pneumonectomy via thoracoscopy, 3 thoracoscopic thymectomy, one pleurectomy and one chest wall resection as initial surgery. The types of procedures regarding the initial surgery were listed in Table 1. Twenty nine (71%) right and 12 (29%) left- sided procedures were performed. Nine (21.9%) patients had benign while 32 (78.1%) patients had malignant diseases. Malignancy was lung cancer in all cases except two with a chest wall chondrosarcoma and a malignant mesothelioma whereas benign diseases included thymic hyperplasia, arteriovenous malformation and bronchiectasis.

Table 1: Type of initial surgery

Type	Group A (n)	Group B (n)	Group C (n)	Group D (n)	Total (n)
Lobectomy via thoracotomy	16	6	4	-	26
Pneumonectomy via thoracotomy	2	1	-	-	3
VATS Lobectomy	5	-	1	-	6
VATS Pneumonectomy	-	-		1	1
VATS Thymectomy	1	1	1	-	3
Chest wall resection	1	-	-	-	1
Pleurectomy	-	1	-	-	1
Total (n)	25	9	6	1	

Duration of initial chylous drainage was 8.1 days for Group A, 7 for Group B, 8.7 for Group C and 1 for Group D, respectively. Since the drainage was >1000 mL/first 24 hours for the patient in Group D, he underwent re-surgery the day following the initial operation. Conservative treatment was adequate for the patients in Group A and B, whereas we performed 2 thoracoscopies and 4 thoracotomies for Group C and one thoracotomy for the patient in Group D. Re-surgery via thoracotomy included thoracic duct ligation for 3 and mass ligation for 2 patients, whereas thoracoscopic correction was achieved by mass ligation for the remaining two cases. Mean hospital stay was 9.7 days for Group A, 8.8 for Group B, 15.1 for Group C and 10 for Group D. Hospital stay following resurgery was calculated as 7.6 and 9 days for the cases in Group C and D, respectively. Data relating the distribution of patients are given in Table 2.

Table 2: The distribution of patients

Parameter	Group A	Group B	Group C	Group D
Number (n)	25	9	6	1
Duration of drainage (mean,days)	8.1	7	8.7	1
Treatment method	Conservative	Conservative	Surgery	Surgery
Type of resurgery (n)	-	-	Thoracotomy: 4 VATS: 2	Thoracotomy:1
Hospital stay / Hospital stay after resurgery (mean,days)	9.7	8.8	15.1 / 7.6	10 / 9

Group A had the largest number of patients whilst Group D had only one patient. All the patients in Group A were discharged in approximately 9.7 days. Group B, including 9 patients, had 8.8 days as an average of in-hospital stay time. Patients in both of these groups were observed conservatively for 8 days at most, then were discharged in 2 days at most after their chest tubes were pulled out. The patients in Group C were also treated conservatively for about 9 days before they underwent correction surgery. The average postoperative in-hospital stay, following the second surgery, was 7.6 days for this group. Group D had only one patient who had a re-surgery regarding to chylous drainage more than 1000 mL in the first postoperative day and was discharged on the ninth day after the second operation.

None of the patients developed any mortality or morbidity, also showed any evidence of recurrence or complication at follow-ups.

Discussion

The majority of iatrogenic trauma to the thoracic duct most commonly occurs following esophageal surgery. However, surgery for congenital heart diseases, pulmonary resection, lymph node dissection or cardiac bypass surgery may also take part in the etiology of postoperative Chylothorax [10].

Treatment modality of chylothorax suggests a conservative approach demanding replacement of fluid and electrolytes, maintenance of nutrition, pharmacological treatment with somatostatin analogue, radiological interventions such as percutaneous duct embolization, and surgical repair. Although there are controversial data in the literature regarding the treatment of chylothorax, most surgeons initiate conservative approach including parenteral nutrition and appropriate fluid-electrolyte balance [11-13]. In addition to diet, it is possible to reduce lymph flow by means of medication using somatostatin or its analogues as octreotide. However, we are not aware of a previous study showing the dose or the duration of a drug administration. This method is accepted to be working and should therefore be continued if the chylous drainage remaines unchanged halves within 48 hours of the start of additional octreotide administration [10].

Patients who fail conservative management may be considered for thoracic duct embolization via percutaneous catheterization and lymphography which comprises a success rate of 71% in traumatic chylothorax [6, 7].

Many authors agree that surgery should be reserved for patients who fail conservative approach with metabolic complications. Surgery can reduce the mortality rate associated with chylothorax from 50 % to 10% [14, 15].

However, the timing of surgery is debatable. Surgery is often recommended when drainage exceeds 1500 mL/day, drain output is up to 1000 mL/ day for 5 or more days, the flow persists for more than 2 weeks or when rapid deterioration in metabolic or nutritional status occurs [15]. Based on our findings, all postoperative chylothoraces may be approached conservatively by oral intake cessation and TPN administration at first step. In our experience, patients developing less than 500 mL/day drainage must be observed closely in terms of nutrition and electrolyte balance up to 10 days. If the drain output is between 500 up to 1000 mL/day for 8 or more days or the flow exceeds 1000 mL in 24 hours after the initial operation, we suggest that re-surgery should be undertaken to avoid mortality and further complications.

Correction surgery includes mass ligation and duct ligation techniques, both offering over 90% success rate [16]. Mass ligation is the ligature of the tissue in the supra-diaphragmatic region between descending thoracic aorta and azygos vein, not only dealing with the thoracic duct but also intervening branches or accessory ducts which may be responsible for surgical failure. Duct ligation in the supra-diaphragmatic area causes the lymphatic fluid and chyle to trail collateral lymphatic channels [9]. Despite of its high success rate, recent papers report rates up to 38.3% and 25% for complications and mortality for surgical correction, respectively [17, 18].

Conclusion

In summary, postoperative chylothorax is an infrequent but a potentially serious complication after thoracic surgery. It may result in mortality and morbidity related to immunodeficiency and malnutrion. Treatment modality varies from conservative approach to surgery. We suggest that all cases with postoperative chylothorax require close observation, also that surgery shall be considered for the patients with deterioration in status or for whom developing drain output of 500 to 1000 mL for at most 8 days or more than 1000 mL in 24 hours after the initial operation. Furthermore, mass and duct ligation techniques do not introduce any additional advantages over one another regarding the surgical outcome. VATS may be preferred as a less invasive surgical approach in experienced and well-developed medical centres.

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