

Transhiatal Supradiaphragmatic Ligation of the Thoracic Duct for Traumatic Chylothorax Complicating Thoracic Esophagectomy: A Report of Two Cases

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Summary. Two patients with postoperative traumatic chylothorax following thoracic esophagectomy for esophageal carcinoma are presented. Both cases of chylothorax were cured by transhiatal supradiaphragmatic ligation of the thoracic duct, our original expedient for supradiaphragmatic ligation of the thoracic duct without thoracotomy. This procedure is simple and easy to perform, and should be feasible for any type of traumatic chylothorax because of the anatomical pathway of the thoracic duct. It also should be preferable for patients with severe intrathoracic adhesions or those with cardiopulmonary complications. We expect that the transhiatal technique for supradiaphragmatic ligation of the thoracic duct will have comprehensive feasibility as a surgical modality for traumatic chylothorax, and might well be an alternative to the transthoracic procedures currently advocated.

Key words—traumatic chylothorax, transhiatal ligation of the thoracic duct, thoracic esophagectomy.

INTRODUCTION

Traumatic chylothorax is largely iatrogenic in nature, resulting from unrecognized injury to the thoracic duct or its tributaries during almost every known intrathoracic and mediastinal surgery. Esophageal resection may cause this intractable and potentially life-threatening complication at incidences of 0.6 to 4%.¹⁾ Early surgical intervention has been stressed for traumatic chylothorax complicating eso-

phagectomy unless it promptly responds to initial conservative treatment mainly consisting of chest drainage and total parenteral nutrition (TPN) with bowel rest.^{2,3)} Either direct suture-closure of the injured site of the thoracic duct or supradiaphragmatic ligation of the thoracic ducts at its lower mediastinal pathway has been recommended as one of the most reliable modalities in such situations.¹⁻⁴⁾ As for the approach to the thoracic duct at reoperation, transthoracic procedures have been conventionally adopted.

We previously reported on transhiatal supradiaphragmatic ligation of the thoracic duct *without thoracotomy*, which was successfully applied to a chylothorax after corrective surgery for Tetralogy of Fallot.⁵⁾ We report here two cases of chylothorax complicating thoracic esophagectomy which was cured by the transhiatal supradiaphragmatic ligation of the thoracic duct, and discuss its feasibility in the treatment of traumatic chylothorax.

CASE REPORTS

Case 1

A 65-year-old female underwent radical esophagectomy with systematic lymphadenectomy of the mediastinum, abdomen and bilateral neck (three-field lymphadenectomy) via right thoracotomy, laparotomy with median phrenotomy, and cervicotomy for a carcinoma located in the middle and lower thoracic esophagus on June 3, 1997. The thoracic duct was ligated at the level of the 10th thoracic vertebra and its confluence to the left jugulosubclavian junction so that its mediastinal part was to be removed. The

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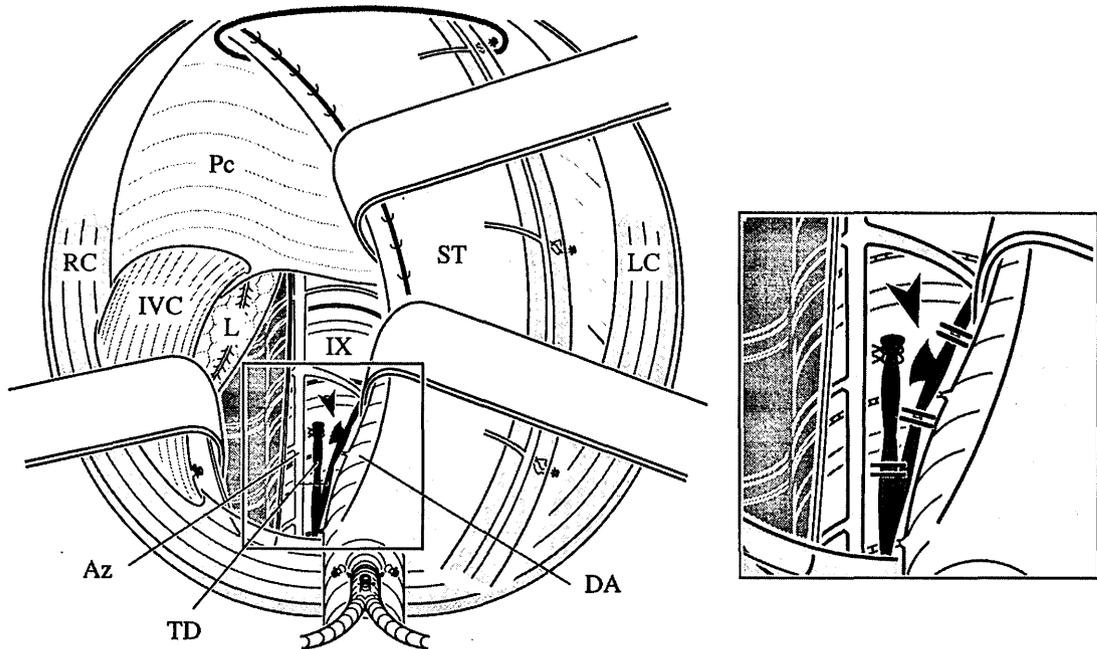


Fig. 1. Mediastinal view at re-exploration in Case 1. Pc, pericardium; IVC, supradiaphragmatic inferior vena cava; RC and LC, right and left crura of the diaphragm; L, left lung, DA, descending aorta; Az, azygos vein; TD, thoracic duct; ST, gastric tube (pulled up to the left neck through the retrosternal space), IX, 9th thoracic vertebra. *Arrowhead* indicates the site of chyle leak. Inlet: enlargement of the square-enclosed area in the left figure. *Bars* indicate ligatures to the thoracic duct.

mid-and low-mediastinal lymphadenectomy was completed by the transhiatal method through the median phrenotomy as described elsewhere.^{6,7)} A gastric tube as an esophageal substitute was anastomosed to the cervical esophagus via the retrosternal space.

On June 15 (12th postoperative day), drains placed in both chest cavities yielded 1,358 ml of serous fluid which was rich in triglyceride (1,022 mg/dl) and positive to Sudan III stain, making a diagnosis of bilateral traumatic chylothorax. Initial treatment with TPN and closed chest drainage failed to control the chyle leak; it persisted 1,000 to 1,700 ml/day for 12 consecutive days. The patient suffered from significant pneumonia during the course.

On June 28 (25th postoperative day), the patient underwent a second operation aiming at transhiatal ligation of the thoracic duct. The principles of the procedure have been described in a previous report.⁵⁾ In brief, the laparotomy and phrenotomy wounds were released to re-explore the posterior low-mediastinum. At re-exploration, it was identified that she had duplicate thoracic ducts: one running just alongside the azygos vein which had been ligated and divided at the first surgery, and another ascending behind the descending aorta which failed to be recognized at that time. Chyle leak from the injured

site of the latter main duct was confirmed with the aid of fatty meal administration from the jejunostomy tube placed at the first surgery. Several clip-ligatures were placed on the duct system as indicated in Fig. 1. Buttress sutures to thin threads distributed in front of the vertebral bodies were added to clear away possible minute lymphatics. Cessation of the chyle leak was achieved immediately after the operation.

Case 2

A 66-year-old male underwent transhiatal radical esophagectomy via laparotomy with median phrenotomy and left cervicotomy⁸⁾ for a lower thoracic esophageal carcinoma on October 28, 1997. Alimentary tract reconstruction was performed by cervical esophagogastrostomy using a gastric tube through posterior mediastinal route.

On November 3 (6th postoperative day), chest drains accumulated 1,235 ml of serous discharge. Fatty meal instillation from a jejunostomy tube rendered the transparent discharge opalescent and milky in appearance, indicating that the patient was accompanied with bilateral chylothorax. Conservative treatment consisting of TPN with plasma infusions

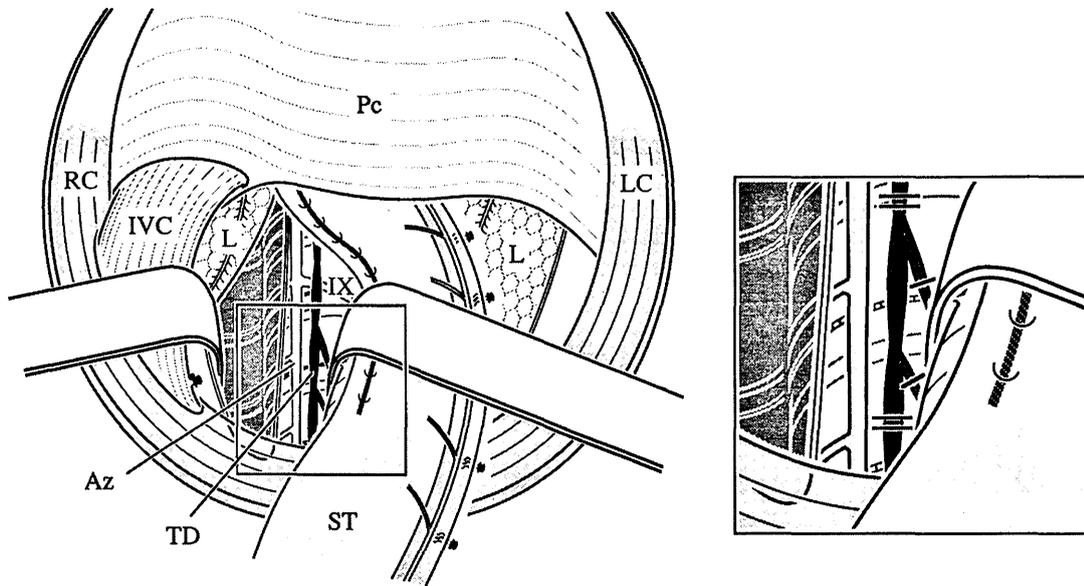


Fig. 2. Mediastinal view at re-exploration in Case 2. Pc, pericardium; IVC, supradiaphragmatic inferior vena cava; RC and LC, right and left crura of the diaphragm; L, right and left lungs; DA, descending aorta; Az, azygos vein; TD, thoracic duct; ST, gastric tube (pulled up to the left neck through the posterior mediastinum); IX, 9th thoracic vertebra. Inlet: enlargement of the square-enclosed area in the left figure. Bars indicate ligatures to the thoracic duct.

Table 1. Summary of the two patients undergoing transhiatal supradiaphragmatic ligation of the thoracic duct

	Patient 1	Patient 2
Age/Sex	65/F	66/M
Body weight	51 kg	33.5 kg
Primary surgery	TTE*	THE**
Chylothorax onset	12 POD	6 POD
Chylothorax side	bilateral	bilateral
Chyle discharge	1,000-1,700 ml/day	600-1,235 ml/day
Transhiatal ligation of the thoracic duct		
Preop. complication	Pneumonia	Pneumonia
Op. time	2 h. 55 min.	1 h. 25 min.
Blood loss	195 g.	53 g.
Chyle leak site	recognized	not recognized
	suture-closed	ignored
Result	successful	successful

* , transthoracic esophagectomy; ** , transhiatal esophagectomy.

and chest drainage did not improve his condition. Chyle leaked out at amounts of 600 to 1,100 ml/day for 7 consecutive days, during which bilateral pneumonia supervened.

On November 11 (14th postoperative day), the patient underwent a second operation. The procedure was essentially the same as that in Case 1. The

thoracic duct system consisting of one main duct and two relatively thick tributaries was revealed at re-exploration, and several clip-ligatures were placed on them (Fig. 2). The site of injury of the thoracic duct, or the site of the chyle leak, was not recognized in the surgical field. It was thought to be at an upstream level, and ignored. The chyle leak diminished rapidly

after the operation.

Clinical details of the two patients are summarized in Table 1.

DISCUSSION

Traumatic chylothorax is an infrequent but well-recognized complication of esophagectomy. With this hazardous complication, the results of nonoperative managements such as chest drainage with dietary manipulation by medium-chain fat administration or TPN with bowel rest seem to be pessimistic; the success rate has been as low as 11 % (3 of 27 cases)³⁾ with high mortality rate,⁹⁾ and prolonged conservative treatment brought about higher morbidity rates and longer hospitalization.²⁾ Orringer et al. stated that traditional conservative treatment was not beneficial in cases of chylothorax after esophagectomy.⁴⁾ Early indication of reoperation appears a favorable policy in the management of traumatic chylothorax after esophagectomy, especially for those with discharge greater than 1,000 ml/day for more than 5 days.¹⁾

Surgical intervention for traumatic chylothorax includes such procedures as ligation of the thoracic duct, pleurodesis by parietal pleurectomy, pleuroperitoneal shunting, and thoracoscopic sealing of duct leak with fibrin glue.¹⁾ Among these, ligation of the thoracic duct has been believed to be a reliable modality with high success rates of around 90 % to 100%.²⁻⁴⁾ Direct closure of the injured site may warrant the most convincing resolution of chylothorax. However, identification of the actual site of chyle leak is not always promising.^{1,10,11)} Supradiaphragmatic ligation of the thoracic duct, or ligation of the thoracic duct at its lower mediastinal pathway, is an alternative. Its rationale is based on the constant anatomy of the thoracic duct in the mediastinum.^{1,15)} The thoracic duct almost routinely courses through the aortic hiatus and ascends between the azygos vein and descending aorta at the levels from Th 12 to Th 8^{12,13)} where the ligation should be carried out.

As for surgical approaches to the thoracic duct aiming at its supradaphragmatic ligation, conventional open thoracotomy, especially on the right side, has been adopted¹⁴⁾ and advocated.¹⁵⁾ There have been, however, several reports describing failure to detect the thoracic duct at re-thoracotomy.^{11,16,17)} The causes of the failure were detailed for one patient:¹¹⁾ difficulty in accessing the thoracic duct and cardiopulmonary problems led to closure of the chest without an achievement of the ligation. Situations like this are likely in patients with intractable chylothorax.

They may have significant intrathoracic adhesions due to prior intrathoracic manipulations, repeated thoracenteses and chemical pleurodeses. Also, as with the two patients presented here, they may have cardiopulmonary problems caused by a body fluid imbalance, malnutrition, and immunodeficiency resulting from large loss of chyle. In such patients, application of transthoracic approaches including recently developed thoracoscopic intervention is troublesome. The transhiatal approach without thoracotomy presented here would appear preferable. As had been mentioned in the previous papers,⁵⁻⁸⁾ the low-mediastinum can be accessed readily by this approach without remarkable effect on the cardiopulmonary function. This approach warrants a wide and direct exposure of the field so that identification of the thoracic duct system even with two or more ducts is facile. Ligation to the thoracic duct can be placed at any level from just above the diaphragm up to Th 6 without much effort.

In summary, the transhiatal technique for supradiaphragmatic ligation of the thoracic duct is simple and easy to perform. This transhiatal technique without thoracotomy would seem preferable for patients with severe intrathoracic adhesions or those with cardiopulmonary problems to whom transthoracic procedures should be avoided. Including the first case previously reported,⁵⁾ we have experienced only 3 cases of chylothorax cured by the transhiatal supradiaphragmatic ligation of the thoracic duct. However, we expect that this modality will have comprehensive feasibility in the treatment of traumatic chylothorax and might well be an alternative to transthoracic procedures currently advocated.

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