

## Case Report

Chylothorax caused by blunt trauma: Case review and management proposal<sup>☆</sup>Brandon T. Bacon<sup>a,b,\*</sup>, Wayne Mashas<sup>b</sup><sup>a</sup> Department of Surgery, University of Missouri-Kansas City, School of Medicine, United States of America<sup>b</sup> Department of Surgery, St. Luke's Hospital of Kansas City, MO, United States of America

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## ABSTRACT

Chylothorax is a potentially devastating complication of lymphatic trauma of the thorax. To date, no recommendations have provided decision making support for prompt definitive treatment. We present a 53 year old male involved in a motor vehicle collision sustaining 9 left rib fractures with flail segments. He was treated non-operatively with a chest tube and no fat diet. A Case report review was performed and a proposed guideline for managing blunt trauma chylothorax in adult patients was developed. In low-output chylothorax, effective initial treatment begins with a no fat diet and chest tube. We propose that a low output leak be defined as < 500 mL of initial output or < 500 mL/day and can be managed non-operatively in nearly 100% of patients. High output injuries of > 1000 mL of initial output will require surgical intervention and should be considered for prompt definitive care.

## Introduction

Chylothorax is the result of disruption, usually injury, to the lymphatic system in the thoracic cavity resulting in the accumulation of chyle in the pleural spaces. There are several etiologies for this phenomenon, the rarest being blunt trauma at approximately 0.2–3% of cases [1,2].

Chylothorax is confirmed diagnostically with analysis of chest effluent [3,5]. Leakage into the chest cavity presents several problems. First, the lymphatic system produces 1.5–2.5 L daily of chyle which can cause a tension chylothorax. Hydrostatic tension in the thorax can lead to cardiopulmonary collapse with subsequent hemodynamic instability. Second, severe nutritional and electrolyte derangements arise from loss of chyle [3]. Third, chyle contains a significant amount of T cells and immunoglobulins. Loss of this fluid into the chest may result in immunologic depletion and higher risk for systemic infections [3,4,11].

Non-operative traumatic chylothorax is rare. Therapeutic guidelines have not been established and experiential recommendations abound. Current literature suggests beginning with conservative therapies such as source control with chest tube placement or thoracentesis, NPO status, TPN, and a medium chain fatty acid diet. More recently, octreotide and somatostatin have mixed results leaning towards benefit [6–10]. Non-operative management is recommended for 2–6 weeks. If conservative therapy fails, procedural or surgical intervention is usually required [1–3,5,12].

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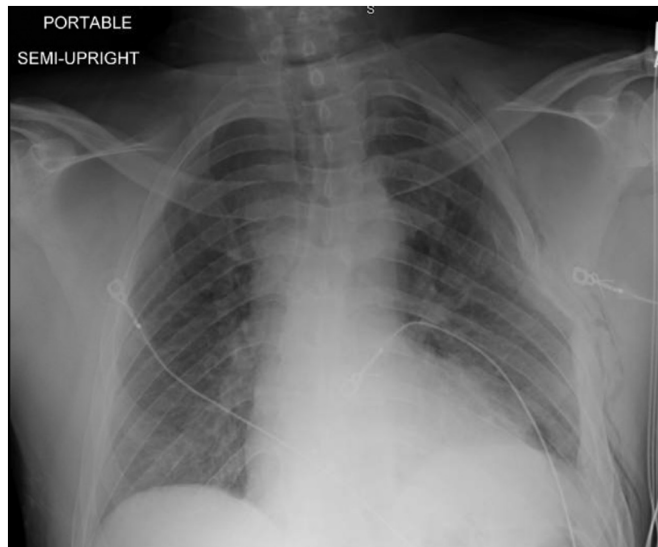


Fig. 1. Initial chest radiograph.

### Case

A 53 year old male was involved in a motor vehicle collision and sustained 9 left rib fractures with flail segments easily seen on chest radiograph and CT scan (see Figs. 1, 2). A 28F chest tube was placed in the trauma bay upon arrival for hemopneumothorax. Two hundred milliliters of blood was evacuated originally. The patient's respiratory status remained adequate and pain was controlled with a PCA pump. After a 5 day admission in the surgical ICU, he was transferred to the surgery inpatient unit. At that time, thoracostomy output was < 200 mL/day.

After starting an oral diet he was found to have approximately 100 mL of milky hydrophobic effluent. The fluid was analyzed and found to be consistent with the diagnosis of chylothorax. He was placed on a strict no fat diet.

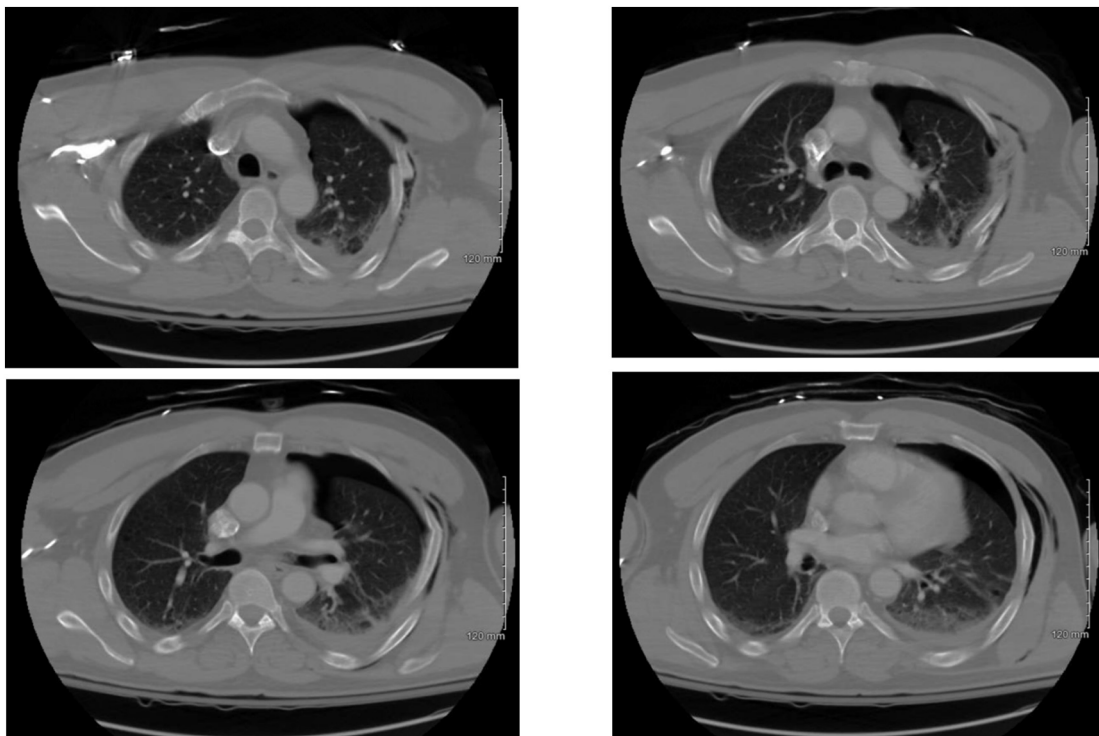


Fig. 2. CT scan of rib fractures.

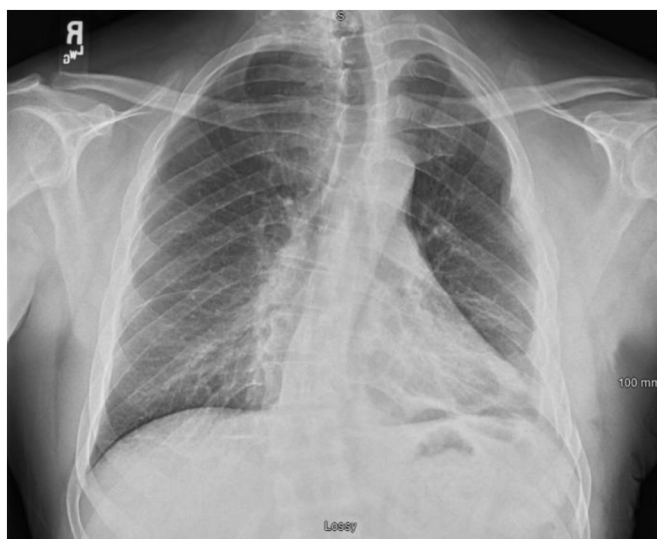


Fig. 3. Three month follow up chest radiograph.

Output from his thoracostomy decreased over the course of 3 days until there was no subjectively visible chyle. The chest tube was removed and subsequent chest x-rays confirmed no re-accumulation of pleural effusion. The patient was discharged after ten days. Three month follow-up chest x-rays verified no further leak (Fig. 3).

## Discussion

Chylothorax is a rare, but potentially devastating disease. Timely effective treatment is imperative to avoid unnecessary morbidity. The decision to treat with non-operative therapies versus surgical intervention has been traditionally based on an escalation model of care at physician discretion. Utilizing timely objective data to guide therapy may improve patient outcomes. The main question of lymphatic duct injury is whether the duct will heal on its own or if it will require ligation.

Thirty-two case reports of chylothorax caused by blunt trauma from 1973 to 2017 were published in English and reviewed. Only 15 (18 total patients) cases reported volume output from chest tube or thoracentesis. The initial outputs were reviewed and recorded along with all the interventions used for each patient (Table 1). Patients with an initial output of < 500 mL (7 of 18) were treated with non-operative therapies (thoracostomy, modified diet of low or no fat, and/or TPN with medium chain fatty acids). These cases had 100% resolution without further intervention. Out of the 8 patients with initial chest tube output of > 1 L, 62.5% (5 of 8) required definitive procedural repair or ligation of the lymphatic duct. The remaining 3 patients with initial output between 500 and 1000 mL had a 66% success rate with non-operative management.

No guidelines at the critical point of deciding to pursue conservative therapy versus surgical intervention in a timely manner

Table 1

Table of case reports that reported volume output of chyle from chylothorax interventions performed with definitive therapy noted.

Author	Year	Initial output (mL/day)	Therapies	Curative therapy
Kumar #2	2013	100	CT, NPO, TPN, octreotide	Conservative
Ikonomidis #1	1998	140	CT, NPO, TPN	Conservative
Ikonomidis #2	1998	240	CT, NPO, TPN	Conservative
Sriprasit	2017	300	CT, NPO, TPN	Conservative
Pakula	2011	400	CT, low fat diet, octreotide	Modified diet
Kumar #1	2013	500	CT, NPO, TPN, octreotide	Conservative
Kumar #3	2013	500	CT, NPO, TPN, octreotide	Conservative
Silen	1995	600	CT, NPO, low fat diet, TPN, Ductal ligation, fibrin glue	Ductal ligation
Townshend	2009	625	CT, NPO, tube feeds via NGT	Modified diet
Seitelman	2012	800	CT, TPN, low fat diet	Conservative
Pai	1984	1000	CT, Low fat diet, TPN, Ductal ligation	Ductal ligation
Breaux	1988	1250	CT, NPO, TPN	Conservative
Idris	2016	1500	CT, fat free diet	Modified diet
Kurklinsky	2011	1500	Thoracentesis, NPO, TPN, embolization	Duct embolization
Chamberlain	2000	2500	CT, NPO, TPN, ductal ligation	Ductal ligation
Lee	2017	3300	CT, NPO, TPN	Ductal ligation
Lindhorst	1998	1000 300	CT, tube feeds, PEEP vent	Modified diet
Golden	1999	3000–4000	CT, NPO, TPN, ductal ligation	Ductal ligation

# Treatment algorithm

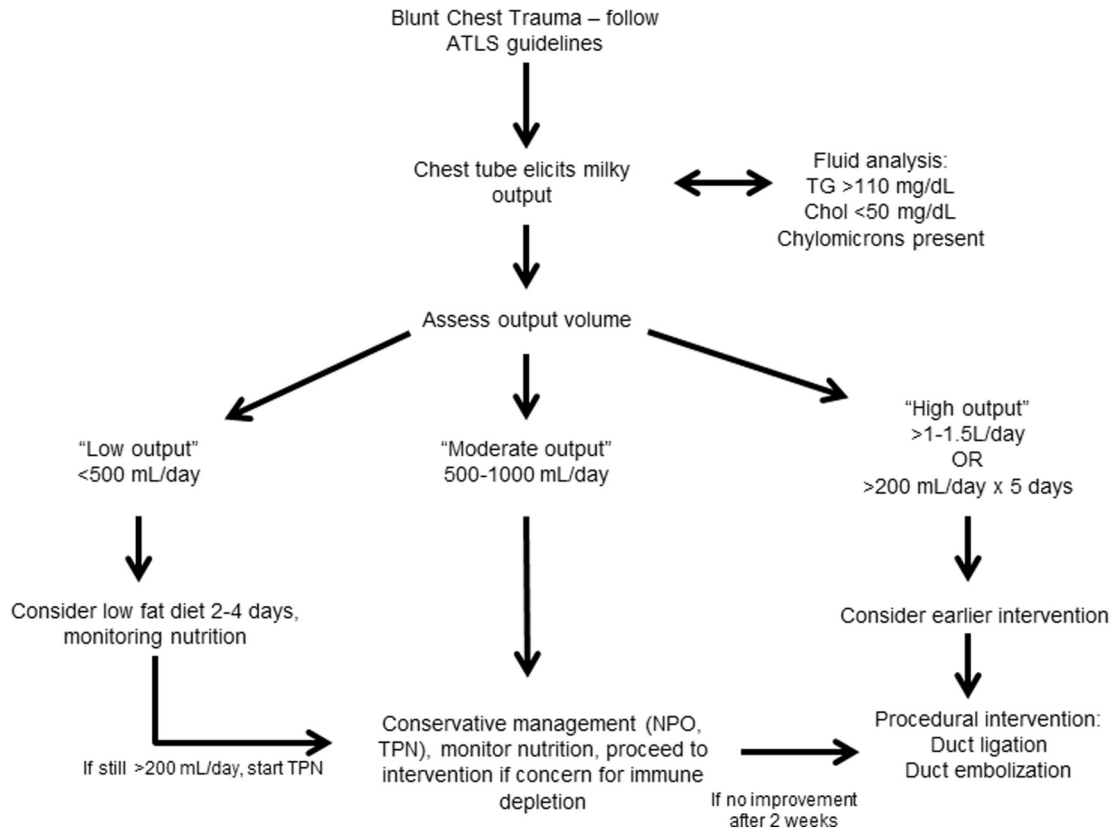


Fig. 4. Proposal of treatment algorithm.

currently exist. From the case report analysis, we developed a therapy algorithm based on low-, moderate-, and high-output chyle leaks (Fig. 4). In low-output settings, a no fat diet was sufficient therapy without need for surgical interventions. High output injuries are less likely to spontaneously resolve with conservative therapy and should be considered for more prompt surgical interventions. Moderate injuries may benefit from conservative therapy. However, if they persist for > 2 weeks, procedural intervention should be considered to reduce morbidity. This algorithm suggests non-operative, conservative therapy is effective for the majority of blunt trauma chylothoraces and can assist practitioners in identifying those patients that will benefit from prompt surgical intervention. Further studies are necessary to validate this algorithm.

## Declaration of competing interest

The authors have no disclosures regarding financial support or conflict of interest.

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