

## **Infected Chylothorax: A Case Report and Review**

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### ***Abstract***

Infected chylothorax is a rare complication of a rare pathology with limited literature entirely consisting of case reports, meeting abstracts, and letters to the editor. The case of a 56-year-old male with a spontaneous infected chylothorax successfully treated and discharged to home without any residual effects is described. A systematic review of the literature revealed 11 prior cases of infected chylothoraces. Their etiologies (when known), initial pleural fluid values, and treatment are described. These cases show that while infected chylothorax has a varied presentation and affects a broad range of patients, conservative management including antibiotics, pleural fluid drainage, and symptomatic relief is a safe and appropriate starting point.

### ***Introduction***

Chylothorax, a pleural effusion caused by chyle accumulation from obstruction or disruption of the thoracic duct (please see SWJPCC's [Image of the week: chylothorax](#) for an image of non-infected chyle fluid), is a rare condition that may arise from a diversity of etiologies broadly categorized as traumatic or non-traumatic/spontaneous (1). Traumatic causes commonly include iatrogenic injury and chest trauma, although insults as minor as sneezing, light exercise and emesis have been reported (1-3). Non-traumatic chylothorax has been linked to several immunologic and infectious etiologies (1). Regardless of the underlying mechanism, chyle has classically been considered inherently bacteriostatic (1). We present a case of spontaneous infected chylothorax and the first review of infected chylothoraces reported in the literature.

### ***Case Report***

A 56-year-old man with alcoholic cirrhosis and remote right-sided hepatic hydrothorax presented to the emergency department complaining of shortness of breath. Patient reported slowly worsening dyspnea over the last six weeks without any other symptoms that had acutely worsened on morning of presentation

Initial vital signs were temperature 38.0°C, heart rate 115, blood pressure 81/60mmHg, and respiratory rate 30 breaths/min on 4L O<sub>2</sub> by nasal cannula; labs significant for white blood cell count of 3100/mm<sup>3</sup> and lactate 5.0 mmol/L (normal <2.0 mmol/L). Physical exam demonstrated a fatigued patient with accessory muscle use on inspiration and absent breath sounds at the left lung base. Computed tomography (CT) study of the

chest showed a large free-flowing left-sided pleural effusion (Figure 1A&B) as well as subacute rib fractures (Image 1C).

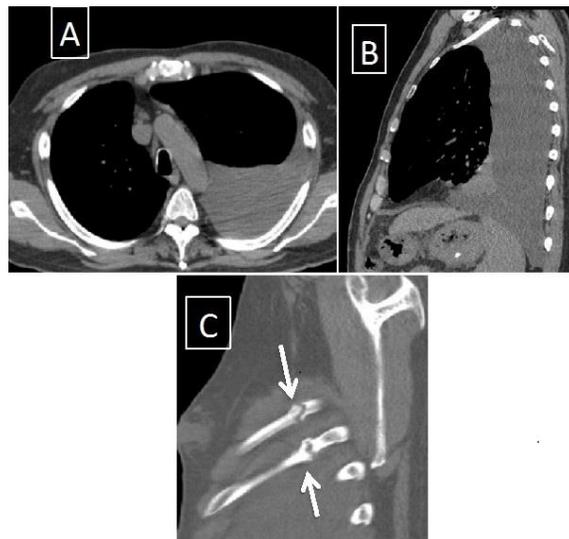


Figure 1. Thoracic CT on the day of presentation. Panel A: Axial view showing pleural effusion. Panel B: Sagittal view showing pleural effusion. Panel C: Coronal view showing rib fractures (white arrows).

Chart review demonstrated an emergency department visit five months previously for a fall with acute left-sided rib fractures and minimal left-sided pleural effusion.

Thoracentesis removed two liters free-flowing, brown, milky, purulent fluid; analysis significant for 58,880 total nucleated cells (32,800 RBCs), 94% neutrophils, glucose <5, LDH 573 IU/dL (serum 193 IU/dL), triglycerides 191 mg/dL, albumin 1.8 g/dL (serum albumin 2.6 g/dL, laboratory lower limit of normal 3.4 g/dL).

The patient remained hypotensive despite fluid boluses, tachypneic with increasing oxygen requirements, and a repeat lactate was 6.4 mmol/L. Norepinephrine and broad-spectrum antibiotics were started and patient was admitted to the intensive care unit.

Pleural fluid and blood cultures grew *Escherichia coli* resistant to fluoroquinolones. Chest x-ray showed persistent pleural effusion; a chest tube was placed which drained an additional 1.6 L over the following 24 hrs. The patient subsequently improved: serum lactate normalized within 24 hours, vasopressors were weaned within 36 hours, and supplemental oxygen was discontinued within 72 hours.

Chest tube output decreased to less than 200 ml/day within 48 hours of placement; however, repeat thoracic CT demonstrated a persistent multi-loculated left pleural effusion. Surgical evacuation and pleurodesis were considered given the lack of literature regarding intrapleural lytic therapy in infected chylothorax (a single case report described use of streptokinase in a persistent non-infected chylothorax, 1). However,

the patient's operative risk was considered prohibitively high. He was managed conservatively with a fat-free diet to reduce chyle leak.

Eleven days after initial presentation fluid studies were significant for triglyceride 45mg/dL with negative cultures. Given that a pleural fluid triglyceride level <50mg/dL yields a less than 5% likelihood of being chylous and the clinical stability of the patient, the chylothorax was felt to be resolved (1). The patient was discharged to home twelve days after initial presentation.

The etiology of patient's infected chylothorax was never fully elucidated. The most likely explanation is the trauma causing rib fractures also caused a traumatic chylothorax that later became infected. The thoracic duct lies alongside the vertebrae until it drains into the left brachiocephalic vein (Figure 2).

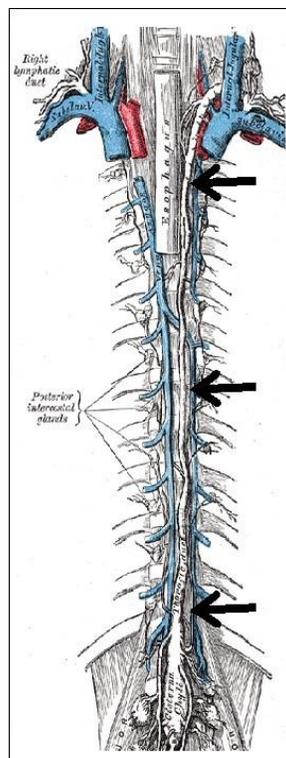


Figure 2. Thoracic duct anatomy (black arrows).

A blow to the posterior left thorax sufficient to fracture multiple ribs is more than sufficient to damage the nearby thoracic duct (1-4). Arguing against this is most patients with large traumatic chylothoraces present within 10 days of injury (1,2).

Another explanation is the patient developed bacterial empyema secondary to hepatic hydrothorax (ascites that has passed through diaphragm from the peritoneal cavity) followed by non-traumatic chylothorax. These empyemas can demonstrate an indolent course and *Escherichia coli* is one of the most common causative pathogens isolated (1). Arguing against this is the patient's previous hepatic hydrothorax was right-sided.

Finally, the chylothorax may have arisen from one of the many known causative medical pathologies (2). Chylous ascites secondary to cirrhosis that migrates into the pleural space via diaphragmatic leaks defects is a known phenomenon, albeit extremely rare (2).

In follow-up two months after discharge the patient had total resolution of respiratory symptoms and no recurrence of the effusion.

## Systematic Review

### Methods

A MEDLINE search (PubMed) from January 1975 to January 2018 and a Google Scholar search (all years) was conducted to identify eligible studies using the following terms: “Infected Chylothorax” (all fields) OR “Infection AND Chylothorax” (all fields) OR “Chylothorax AND Empyema” (all fields) OR “Chylous Empyema” (all fields). The inclusion criteria for studies were patients with infected non-traumatic chylothorax. A triglyceride level > 110 mg/dL or the presence of chylomicrons in pleural fluid was used to confirm the diagnosis of chylothorax; pleural fluid culture speciation was used to confirm the infection. The exclusion criteria were a lack of laboratory data and duplicate data. Two reviewers (LE, LG) independently reviewed the titles, abstracts, and, when necessary, the full text regarding the inclusion/exclusion criteria. Data extraction was performed independently by two reviewers (LE, LG) using data extraction forms defined beforehand. Discrepancies were resolved by consensus discussion with a third reviewer (MK).

### Results

Eight case reports, two published abstracts, and one letter to the editor met the inclusion criteria; all eleven were included in the analysis (Figure 3, 13-23).

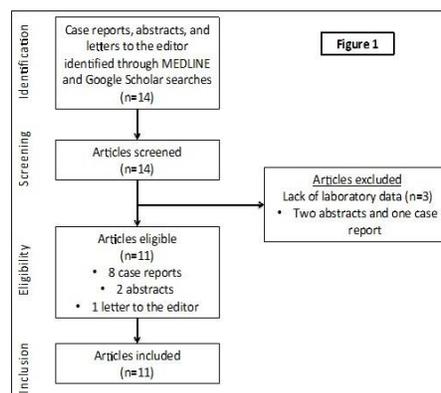


Figure 3. Flow diagram of the literature review.

The general characteristics, demographics, and etiology of infected chylothorax are summarized in Table 1, the initial pleural fluid values are reported in Table 2.

Table 1. Population data.

	Year	Demographics	Etiology	Organism	Bacteremia, Parasitemia, or Sepsis?	Medical or surgical management?	Outcome?
Bensoussan et al [13]	1975	5 day old female, no significant medical history in patient or mother	Unknown	<i>Staphylococcus aureus</i>	No	Medically managed, single right-sided chest tube for 5 days	Survived to discharge, no complications; well child visit @ 10 months was unremarkable
Asnis et al [14]	1994	55 year old female five weeks post dental extraction	Parapneumonic effusion that seeded a chylous effusion	<i>Fusobacterium nucleatum</i>	Yes	Medically managed, single left-sided chest tube for 6 days	Survived to discharge; asymptomatic at 6 month follow-up
Natrajan et al [15]	1998	44yo male with chronic alcohol abuse and on immunosuppressive therapy for renal transplant	Unknown	<i>Streptococcus viridans</i>	No	Medically managed, single right-sided chest tube for 7 days	Survived to discharge, passed away 18 months later from intracerebral hemorrhage
Guarracino et al [16]	2000	3yo male with severe external burns (30% body surface area) and inhalation injury	Secondary to prolonged intubation due to severe acute respiratory distress syndrome	<i>Pneumococcus</i> (unspiciated) and <i>Streptococcus</i> (unspiciated)	Yes	Medically managed, bilateral chest tubes (right-sided for 1 day, left-sided for 21 days)	Unknown
Wang et al [17]	2000	33yo female, no significant PMH/PSH	Unknown	<i>Streptococcus agalactiae</i>	No	Surgically managed with thoracic duct ligation and decortication on hospital day 15	Survived to discharge, no complications; 2 years post-procedure patient was asymptomatic
Biswas et al [18]	2008	4yo male two days post endoscopic removal of foreign body	Iatrogenic chylothorax with unknown seeding of effusion (blood cultures negative)	<i>Escherichia coli</i>	No	Medically managed, single left-sided chest tube for 14 days	Survived to discharge, no complications
Alkassis et al [19]	2010	65yo male with right lower lobe pneumonia and parapneumonic effusion	Iatrogenic chylothorax from chest tube placement with seeding from pneumonia / parapneumonic effusion	<i>Streptococcus viridans</i>	Unknown	Medically managed, single chest tube for 9 days	Unknown
Epelbaum et al [20]	2011	64yo female with diabetes	Unknown	<i>Streptococcus viridans</i>	No	Surgically managed with video-assisted thoracic surgery and decortication	Survived to discharge, no complications
Wright et al [21]	2011	54yo male no significant PMH/PSH	Unknown	<i>Paragonimus westermani</i>	No	Medically managed, no chest tube, two large volume thoracenteses	Survived to discharge; asymptomatic at 16 month follow-up
Bakar et al [22]	2012	38yo female with severe subarachnoid hemorrhage three days post basilar artery coil embolization	Iatrogenic bilateral infected chylothorax	<i>Acinetobacter calcoaceticus-baumannii complex</i>	Yes	Medically managed, multiple bilateral chest tubes	Passed away 10 days after presentation from subfalcine herniation
Berardino et al [23]	2014	78 year old male with severe COPD, Factor V Leiden with multiple pulmonary embolisms	Unknown	<i>Prevotella bivia</i>	Yes	Medically managed, multiple right-sided chest tubes	Survived to discharge; asymptomatic at 6 month follow-up

Table 2. Initial pleural fluid values.

	Year	Appearance	pH	WBC mm <sup>3</sup> (%PMNs)	Protein g/dL	Glucose mg/dL (mmol/L)	Lactate Dehydrogenase U/L	Amylase U/L	Triglycerides mg/dL (mmol/L)	Cholesterol mg/dL (mmol/L)
Bensoussan et al [13]	1975	X	X	X	3.2	X	X	X	Lipid 213mg/dL	
Asnis et al [14]	1994	"Foul-smelling, thick, yellow, turbid"	6.35	5,850 (80%)	0.31	23 (1.28)	480	49	260 (2.94)	X
Natrajan et al [15]	1998	"Creamy white and foul smelling"	5.6	490,000 (X)	X	14 (0.77)	22,070	X	727 (8.21)	X
Guarracino et al [16]	2000	"Yellow turbid fluid"	X	X (70%)	4	X	238	59	160 (1.81)	73 (1.89)
Wang et al [17]	2000	"Milky appearance"	X	11,300 (96%)	4.3	10 (0.56)	847	X	130 (1.47)	108 (2.79)
Biswas et al [18]	2008	"Milky white opalescent fluid"	X	X	2.5	25 (1.39)	X	X	736 (8.32)	26 (0.67)
Alkassis et al [19]	2010	"Thick and milky in nature"	X	61,700 (90%)	X	35 (1.94)	5,639	X	280 (3.16)	X
Epelbaum et al [20]	2011	"Turbid, milky pleural fluid"	5	520,000 (94%)	2.6	8 (0.44)	2,759	6	202 (2.28)	36 (0.93)
Wright et al [21]	2011	"Viscous and chalky fluid"	7.08	17,200 (X)	11.9	7 (0.39)	2,714	X	131 (1.48)	X
Bakar et al [22]	2012	"Milky fluid"	X	X	X	X	X	X	3,534 (39.93)	32 (0.83)
Berardino et al [23]	2014	"Purulent fluid"	6.8	10,840 (96%)	X	X	1,320	X	270 (3.05)	10 (0.26)
		<b>Median [min - max]</b>	<b>6.35 [5 - 7.08]</b>	<b>17,200 [5,850-520,000] (92% [70%-96%]) (87.7% [10.5])</b>	<b>3.2 [0.31-11.9]</b>	<b>14 [7-35] (1.28 [0.39-1.94])</b>	<b>2017 [238-22,070]</b>	<b>49 [6-59]</b>	<b>683 [1095] (7.72 [12.37])</b>	<b>47.5 [36.2] (1.23 [0.94])</b>

There were 11 patients total: six males and five females; age range 5 days-78 years, mean age 40.5 years (standard deviation 28.5 years). One patient was pharmacologically immunosuppressed while others had chronic diseases known to reduce immune system function including diabetes, excessive alcohol intake, and obesity (24-26). Four (36%) were iatrogenic. Three patients (27%) were infected with *Streptococcus viridans* and five (45%) were infected with *Streptococcus* genus. In those with available data, three of ten patients (30%) required intravenous vasopressors. No patients required ventilator management for their chylothorax (two patients were already intubated, one for acute respiratory distress syndrome, the other for unstable hemodynamics secondary to large subarachnoid hemorrhage). Two patients (18%) were managed surgically – one was specifically noted to have failed conservative management (17). Of the known outcomes, eight of nine (89%) survived to discharge and all eight remained asymptomatic at follow-up. The mean follow-up duration was 13.3 months (range 6-24 months).

### **Discussion**

Given the paucity of published experience regarding infected chylothoraces, we believe a descriptive summary is warranted. First, there is a large variation in patient characteristics, including age range, immune competence, comorbid medical conditions, and infectious organism (eight different bacterial species and one parasite).

Second, many of the reviewed cases had a more benign presentation than might be anticipated in the context of a large, infected intrathoracic fluid collection. Seven of the patients (73%) were hemodynamically stable on presentation and the majority of these patients had very mild chief complaints.

Third, the available data suggest a surprisingly good prognosis considering a previously estimated mortality of 10-25% in non-infected chylothoraces, depending on etiology (27). The one patient who did not survive to discharge died due to brain herniation. Those with documented outpatient follow-up were asymptomatic up to 16 months post-discharge.

Fourth, conservative management was frequently efficacious. Eight patients (73%) were medically managed without complication and did not require extensive antibiotic duration, intrapleural lytic therapy, or surgical intervention. The decision to pursue surgical intervention is not well defined given the very limited number of cases requiring surgical management. A brief discussion of non-infected chylothoraces and their management is therefore warranted.

Non-infected chylothorax is universally described as a rare event, although its exact incidence has not been described. Chylous ascites, which sometimes shares pathogenesis with chylothorax and is one of the causes of spontaneous chylothorax, has an occurrence of one in 20,000 hospital admissions (12). Trauma accounts for approximately 50% of chylothoraces, with esophagectomy being the most common iatrogenic cause (28). Thirty percent are due to malignancy; lymphoma accounts for 70-

75% of malignant cases (11). While there are no consensus guidelines on how to treat chylothoraces, many authors agree that first line treatment is conservative management with thoracentesis or chest tube drainage, fat free or medium chain triglyceride diet, and consideration of somatostatin or octreotide (1,5,11,27-29). Although somatostatin or octreotide are used at many institutions, data regarding indications & efficacy of these medications are limited and/or inconsistent – some institutions use these medications at the beginning of treatment, others only if/when initial management has failed (5,27).

Additional treatments may depend on the etiology of the chylothorax: it is suggested that earlier surgical intervention in iatrogenic traumatic chylothoraces, especially post-esophagectomy, may be beneficial (30). Conservative management is likely to fail and surgical intervention is recommended in the following situations: 1) daily drainage greater than 1000 mL chyle (adults) or greater than 100mL chyle/kg body weight (children); 2) chyle leak that persists for more than 14 days; 3) unchanged chest tube output for 7-14 days; 4) clinical deterioration (27,28).

Conservative management for infected chylothoraces appears efficacious in our small sample size with the obvious modification of treating the infection. Most antibiotics adequately penetrate the pleural space, although aminoglycosides should be avoided as they appear to be inactivated by the low pH and relative anaerobic conditions (31).

### ***Limitations***

The limitation of this systematic review was the inclusion of only case reports, abstracts, and letters to the editor and the small sample size. Unfortunately, given the rarity of infected chylothoraces, studies with sufficient sample size are unlikely to be available.

### ***Conclusion***

Infected chylothorax is a rare complication of an already rare pathology. Our case report and literature review show that it can affect any age group, can be caused by several different organisms, and has a variable presentation. Our data suggests that an initial conservative management strategy in infected chylothoraces can be a safe and effective option.

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