

A Case of Child Abuse Presenting With a Traumatic Chylothorax

STEPHANIE RUEST, MD, MPH; MEGHAN BEUCHER, MD

ABSTRACT

Chylothorax is a rare cause of pleural effusion in young children and may result from congenital lymphatic abnormalities, trauma, tumors, and systemic infections. Here we discuss a case of a previously healthy toddler who presented to the emergency department with fever and refusal to walk and subsequently developed respiratory distress with concern for impending respiratory failure. A large right sided pleural effusion was identified and ultimately determined to be consistent with chylothorax secondary to inflicted trauma.

KEYWORDS: chylothorax, child abuse, trauma

BACKGROUND

Chyle is a lymphatic fluid composed primarily of fat, cholesterol, electrolytes, lymphocytes, proteins (including immunoglobulins) and glucose.^{1,2} Chylothorax, an accumulation of chyle in the pleural space, is a rare cause of pleural effusion in infants and children, and generally occurs due to disruption of the thoracic duct.¹ The true incidence is unknown.¹ Chylothorax in the pediatric population is most commonly seen in infants and young children due to a congenital abnormality of the lymphatics or in the setting of cardiothoracic surgery; however, traumatic chylothorax can occur secondary to unintentional or intentional (inflicted, abusive) trauma.^{1,2} Additional atraumatic causes may include neoplastic processes and infection. Rarely, the cause of chylothorax is determined to be idiopathic, after extensive evaluation reveals no other clear etiology.

Much of what is known about chylothorax in the pediatric population comes from case reports and case series. While the literature focused on congenital chylothorax and chylothorax secondary to cardiothoracic surgical complications is more robust, there are few publications detailing traumatic chylothorax in pediatric patients. Chylothorax as a presenting finding leading to the diagnosis of child abuse is rare, with limited case reports published in the past 30 years.³⁻⁸ This case study adds to the limited body of literature of inflicted traumatic chylothorax secondary to child abuse.

CASE PRESENTATION

A 15-month-old ex-full-term male with no reported medical history and normal motor development presented to the emergency department with a parental chief complaint of decreased oral intake, refusal to walk and a reported fever to 101°F. Parents reported that he vomited in his crib two nights prior as well as on the morning of presentation and noted that he had also been refusing to walk during this time. They denied any trauma or injury. He had been making at least 4–5 wet diapers daily with a normal non-bloody stool the day of presentation. Parents denied any congestion, rhinorrhea, coughing, difficulty breathing, or rash. The child lived at home with parents and there were no other caregivers. Review of systems was otherwise negative, and he was up-to-date on vaccinations. Upon review of his past medical history, his mother noted that he was brought to the pediatrician approximately one month prior for a bruise on his chest of unclear etiology; however, no further work-up was pursued at that time, per her report.

VS on arrival: T 100.5°F, HR 166, BP 124/76 on the left lower leg, RR 60, 99% on room air. After a dose of ibuprofen, vital signs normalized. The patient was described as pale, tired appearing, and irritable in his mother's arms. There was a small bruise adjacent to the right eye and bilateral periorbital petechiae. His mucus membranes were moist with a non-specific lesion on the tip of the tongue. His lung fields were clear without any increased work of breathing and his cardiac examination was unremarkable, although the cardiopulmonary exam was noted to be limited by the patient crying. The abdomen was slightly distended; due to ongoing crying, focal tenderness was unable to be appreciated. He was able to passively range both lower extremities at all joints without obvious discomfort. There were no areas of swelling, bruising, or apparent focal pain with palpation; however, when attempts were made to stand him up, he pulled up his legs, cried, and refused to bear weight.

Given the patient's ill appearance and vital signs on arrival, a broad work-up was undertaken with concern for possible sepsis, accidental versus inflicted injury, intra-abdominal surgical process, and hematologic/oncologic causes, among other etiologies. Blood cultures were sent, and empiric antibiotics were initiated. Initial labs are seen in **Table 1**.

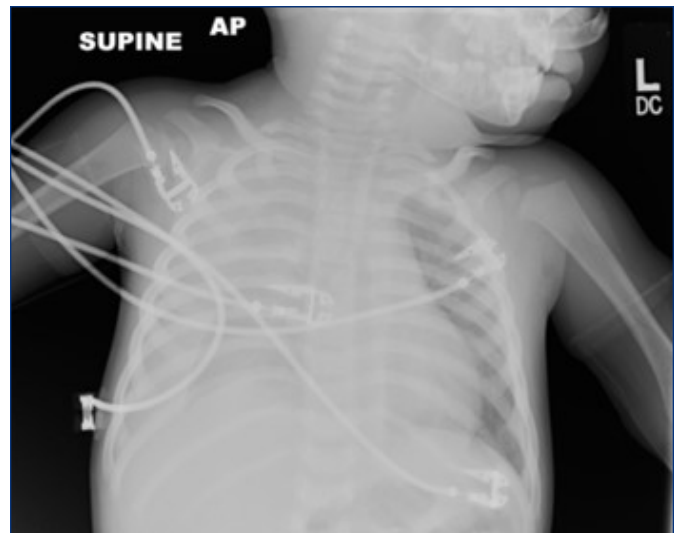
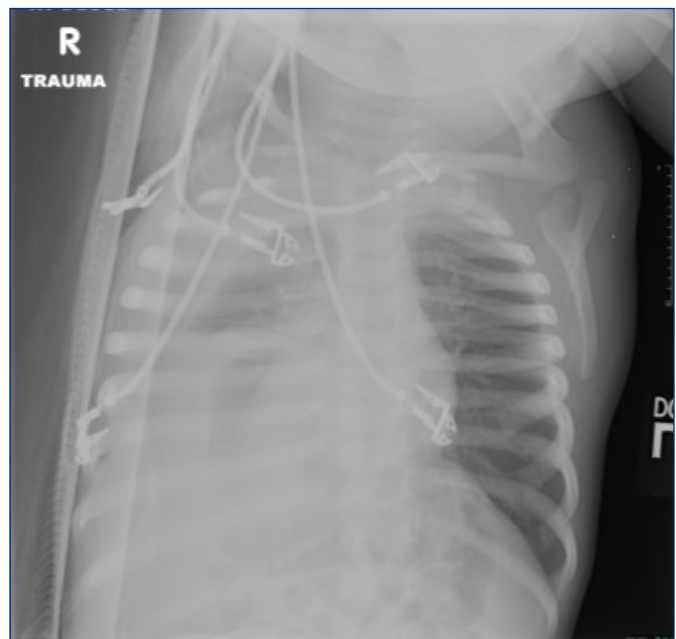
Given the presence of abdominal distension with limited ability to assess for focal pain and concern that his refusal to

Table 1. Emergency Department Laboratory Results

Diagnostic Test	Result	Normal Range
CBC		
WBC	10.8	4.9–15.0 $\times 10^9/L$
Hemoglobin	12.8	10.5–13.5 g/dL
Hematocrit	38.9	32.0–43.8%
Platelets	636	150–400 $\times 10^9/L$
Differential	Normal differential for age	
Coagulation studies		
PT	13.1	10.6–11.4 sec
PTT	25.0	24.0–3.0 sec
INR	1.2	0.8–1.2 sec
Comprehensive Metabolic Panel		
Glucose	102	60–100 mg/dL
BUN	13	5–27 mg/dL
Creatinine	0.20	0.30–0.70 mg/dL
Sodium	135	132–143 mEq/L
Potassium	5.0	3.4–4.7 mEq/L
Chloride	103	99–116 mEq/L
CO ₂	22	22–32 mEq/L
Anion Gap	10	3–13
Calcium	9.8	8.9–10.3 mg/dL
AST	43	22–58 IU/L
ALT	49	11–39 IU/L
Other labs		
Troponin	<0.006	0.006–0.060 ng/mL
Lactate	2.2	0.2–1.9 mEq/L
Lipase	3	10–60 IU/L
CRP	47.77	0.00–10.00 mg/L
ESR	15	0–15 mm/h
Microbiology		
Blood culture	No growth	

bear weight could have been due to referred abdominal pain, an ultrasound was obtained to assess for an intra-abdominal surgical process. Upon return from ultrasound, the child was noted to be pale, mottled, tachypneic, and grunting. A complete undressed re-examination was notable for newly appreciated diminished breath sounds on the right and fullness and significant tenderness over the right paraspinal thoracolumbar back. The patient was moved to a critical care room for further evaluation and treatment. While the abdominal ultrasound did not reveal a clear intra-abdominal pathology, it did demonstrate a very large right-sided pleural effusion. An anterior-posterior (Figures 1a,b) and lateral-decubitus chest X-ray redemonstrated a large pleural effusion with a loculated component. The differential diagnosis was narrowed to include an infectious or oncologic process with parapneumonic effusion versus a traumatic effusion.

The patient subsequently rapidly deteriorated with poor perfusion, mottling, increased tachycardia, and decreased respiratory effort with concern for evolving tension physiology and impending cardiorespiratory failure. Fluid resuscitation was provided with improved hemodynamics and

Figure 1a. Anterior posterior chest X-ray**Figure 1b.** Right lateral decubitus chest X-ray

perfusion, and the patient underwent rapid sequence intubation with immediate post-intubation chest tube placement by pediatric surgery. A large volume of milky-white fluid was drained upon placement of the pigtail catheter; fluid was sent for analysis, and ultimately found to be consistent with chylothorax.

While in the pediatric ICU, the paraspinal back fullness developed into a hematoma and there were evolving facial petechiae and bruises. Given these findings in addition to a chylothorax of unknown etiology, a full non-accidental trauma evaluation was completed, including a CT-panscan, skeletal survey, and MRI of the spine. Numerous injuries were identified, including a T12 posterior vertebral body

Figure 2a. Chest CT sagittal view with T12 vertebral body fracture

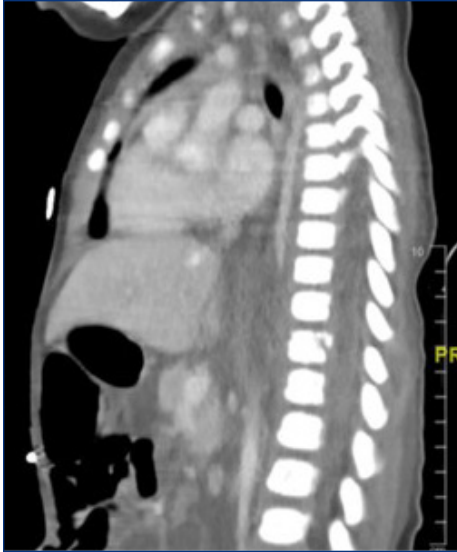


Figure 2b. Left forearm X-ray with subacute distal radial buckle fracture



Figure 2c. Right upper extremity X-ray with subacute fracture of the humeral metaphysis and ulnar bowing



fracture with epidural hematoma and soft tissue swelling of the back (**Figure 2a**), bilateral rib fractures (not shown), bilateral subacute upper extremity fractures (**Figures 2b,c**), and a subacute femur fracture (not shown), confirming the diagnosis of child abuse. All blood and pleural fluid cultures were negative and work-up for hematologic and oncologic pathologies and metabolic bone disease was negative. He was extubated on hospital day 3. His chyle leak resolved with non-operative management and the chest tube was removed. No clear disclosure of inflicted injury was made by the parents; however, given the multiple injuries in various stages of healing, the patient was discharged into foster care.

DISCUSSION

Here we report a previously healthy toddler presenting with a variety of non-specific complaints, ill appearance, and subsequent development of respiratory distress, tachycardia, and poor perfusion, concerning for evolving tension physiology and impending respiratory failure. He was ultimately found to have a traumatic chylothorax and numerous orthopedic and cutaneous injuries in various stages of healing, consistent with a diagnosis of child abuse.

Child maltreatment is an unfortunately common occurrence, affecting over 8 per 1,000 children in the United States in 2021, equating to approximately 600,000 victims of child maltreatment per year.⁹ Inflicted injuries, or child physical abuse, is estimated to account for 16% of all child maltreatment, with the remainder of cases involving neglect or other forms of abuse.⁹ In Rhode Island, the rate of child maltreatment is estimated to be 11.6 per 1,000 children, with approximately 40% of these cases in the form of abuse, and 60% in the form of neglect.¹⁰ The presentation

of child abuse can be varied and the diagnosis may not be straightforward. Because of the complexity of this diagnosis, a high index of suspicion for child abuse must be maintained when evaluating a pediatric patient with unexplained and/or uncommon findings.

Highlighting the rarity of its occurrence, only six prior case reports of traumatic chylothorax in the setting of child abuse have been published between 1980 and 2021,³⁻⁸ all of which presented with respiratory symptoms and a varied combination of readily apparent and occult skeletal and cutaneous injuries. This is the first report known to the authors to describe an evolving traumatic tension chylothorax secondary to child abuse. Only one case of tension chylothorax in a toddler in the setting of non-inflicted injury has been previously reported.¹¹

Because chylothorax may occur in the setting of blunt trauma, specifically due to forceful blows to the back, abdomen, or chest, its identification in a young patient should raise concern for the possibility of inflicted injury. Of note, blunt trauma to the thoracic spine or chest can cause injury to the thoracic duct even in the absence of obvious surrounding injuries,² and careful consideration of inflicted trauma must be undertaken when a chylothorax is identified. It is imperative that the involved clinicians complete both a medical work-up to identify atraumatic causes of chylothorax (e.g., infectious and oncologic) as well as a detailed child abuse evaluation to identify other occult injuries, as was done for this described patient.

It has been reported that chylothorax secondary to blunt trauma most commonly occurs on the right side, in the region of the 9th or 10th thoracic vertebra.¹² The described patient had multiple injuries, including a fracture of the thoracic spine and bilateral rib fractures. Furthermore, a latent

period of 2-10 days between the time of the blunt trauma and the development of pleural effusion has been reported.^{2,13,14} In this case, parents report a variety of symptoms that began two days prior to his initial presentation, which may have corresponded to when the acute injuries were inflicted. As the effusion progresses, the rapid accumulation of chyle in the pleural space can lead to respiratory compromise and possible tension physiology, as was also seen in this case.

CONCLUSION

Chylothorax is a rare cause of pleural effusion in infants and young children and may be caused by atraumatic and traumatic causes. A thorough evaluation for medical and traumatic etiologies must be undertaken, and in the absence of an alternative clear etiology, pursuit of a full child abuse evaluation is recommended.

References

1. Tutor JD. Chylothorax in infants and children. *Pediatrics*. 2014 Apr;133(4):722-33. doi: 10.1542/peds.2013-2072. Epub 2014 Mar 31. PMID: 24685960.
2. Rudrappa M, Paul M. Chylothorax. 2023 Feb 21. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. PMID: 29083798.
3. Green HG. Child abuse presenting as chylothorax. *Pediatrics*. 1980 Oct;66(4):620-1. PMID: 7432847.
4. Guleserian KJ, Gilchrist BF, Luks FI, Wesselhoeft CW, DeLuca FG. Child abuse as a cause of traumatic chylothorax. *J Pediatr Surg*. 1996 Dec;31(12):1696-7. doi: 10.1016/s0022-3468(96)90054-8. PMID: 8986993.
5. Geismar SL, Tilelli JA, Campbell JB, Chiaro JJ. Chylothorax as a manifestation of child abuse. *Pediatr Emerg Care*. 1997 Dec;13(6):386-9. doi: 10.1097/00006565-199712000-00007. PMID: 9434996.
6. Ichikawa Y, Sato A, Sato K, Nakamura K, Kitagawa N, Tanoue K, Shiro H. Chylothorax associated with child abuse. *Pediatr Int*. 2015 Dec;57(6):1202-4. doi: 10.1111/ped.12707. Epub 2015 Sep 21. PMID: 26388541.
7. Anderst JD. Chylothorax and child abuse. *Pediatr Crit Care Med*. 2007 Jul;8(4):394-6. doi: 10.1097/01.PCC.0000269392.72938.76. PMID: 17545935.
8. Thornley P, Peterson D, Kishta W. Child Abuse with Thoracolumbar Fracture-Dislocation Treated with Pedicle Screw Fixation in a 2-Year-Old: A Case Report. *JBJS Case Connect*. 2021 Dec 22;11(4). doi: 10.2106/JBJS.CC.21.00129. PMID: 34937046.
9. U.S. Department of Health & Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau. (2023). Child Maltreatment 2021. Available from <https://www.acf.hhs.gov/cb/data-research/child-maltreatment>. Accessed 7/13/2023.
10. Rhode Island Department of Children, Youth and Families. Safety Report: October 1, 2018 – September 30, 2021 (FFY19 – FFY21). Data and Evaluation. May 2022. <https://dcyf.ri.gov/sites/g/files/xkqgbur416/files/2022-06/Annual%20Safety%20Report%20FFY21%20FINAL%20V2.pdf>. Accessed 8/24/2023.
11. Snow BD, Salcedo ES, Galante JM, Greenholz SK. Traumatic tension chylothorax in a child: A case report. *J of Pediatric Surgery Case Reports*. 2015;3(4):163-165.
12. Thorne PS. Traumatic chylothorax. *Tubercle*. 1958;39(1):29-34
13. Soto-Martinez M, Massie J. Chylothorax: diagnosis and management in children. *Paediatr Respir Rev*. 2009;10(4):199-207
14. Light RW. Chylothorax and pseudochylothorax. In: *Pleural Diseases*, 6th ed. Philadelphia, PA: Wolters Kluwe

Authors

Stephanie Ruest, MD, MPH, Departments of Emergency Medicine and Pediatrics, Alpert Medical School of Brown University, Providence, RI.

Meghan Beucher, MD, Departments of Emergency Medicine and Pediatrics, Alpert Medical School of Brown University, Providence, RI.

Correspondence

Stephanie Ruest, MD, MPH
55 Claverick Street, 2nd Floor
Providence, RI 02903
Stephanie_Ruest@Brown.edu

Disclosures

The authors have no financial disclosures.