CHEST Original Research

PLEURAL DISEASE

Pleural Fluid Analysis in Chylous Pleural Effusion*

Vishal Agrawal, MD; Peter Doelken, MD, FCCP; and Steven A. Sahn, MD, FCCP

Objectives: **Chyle is a noninflammatory, lymphocyte-predominant fluid that may cause a pleural effusion as a consequence of thoracic duct leakage into the pleural space. Although chyle is reported to have protein concentrations in the transudative range, chylous effusions are typically exudative, as defined by the standard criteria. We hypothesized that chylous effusions from a thoracic duct leak alone have low lactate dehydrogenase (LDH) concentrations due to the absence of inflammation and are lymphocyte-predominant, protein-discordant exudates. Consequently, pleural effusions that do not meet these criteria but with triglyceride concentrations of > 110 mg/dL or are positive for chylomicrons should be associated with other diagnoses contributing to pleural fluid formation.**

Study design: **Retrospective.**

Methods: **The pleural fluid analyses of 876 consecutive thoracenteses were reviewed. All cases with a triglyceride concentration of > 110 mg/dL or the presence of chylomicrons were retrieved. The effusions were then classified as transudates, concordant exudates, protein-discordant exudates, and LDH-discordant exudates, and according to lymphocyte predominance (> 50%). The causes of these pleural effusions were determined after the review of the medical record.**

Results: **Twenty-two pleural effusions had elevated triglyceride concentrations and/or were positive for chylomicrons. Eleven effusions were lymphocyte-predominant, protein-discordant exudates, and two of these were associated with chylous ascites. The remaining effusions were transudates (n = 7) or concordant exudates (n = 4); all were associated with conditions known to cause pleural effusion apart from chyle leakage.**

Conclusion: **Chylous effusions caused solely by conditions known to cause chylothorax were lymphocyte-predominant, protein-discordant exudates. Protein concentrations in the transudative range or elevated LDH concentrations were associated with a coexisting condition that may impact the management of these chylous effusions.** ***(CHEST 2008; 133:1436–1441)***

Key words: chyle; chylothorax; chylous ascites; chylous pleural effusion; thoracic duct

Abbreviations: LDH = lactate dehydrogenase; PFA = pleural fluid analysis

Chylothorax is a pleural effusion caused by the extravasation of chyle into the pleural space due to obstruction or injury of the thoracic duct.[1] On occasion, the chyle leak is infradiaphragmatic.[2] A triglyceride concentration of > 110 mg/dL or the presence of chylomicrons in the pleural fluid are criteria typically used to confirm the presence of chyle.[3] However, an elevated triglyceride concentration or the presence of chylomicrons in a pleural effusion does not exclude the concomitant causes of pleural fluid formation, in addition to the accumulation of chyle in the pleural space. Therefore, clinical decision making must include an assessment of the significance of the presence of chyle in the effusion. The aim of our investigation was to determine whether the interpretation of the initial pleural fluid analysis (PFA) using these criteria could provide further diagnostic value when elevated triglyceride levels or chylomicrons are encountered in the PFA.

Materials and Methods

The study was approved by the Institutional Review Board of the Medical University of South Carolina. Consent was waived

due to the retrospective design of the investigation. The PFAs of 876 consecutive, ultrasound-guided thoracenteses performed by the Pleural Procedure Service at the Medical University of South Carolina from January 2001 to December 2006 were reviewed. We retrieved all cases from our database showing either an elevated triglyceride concentration (*ie*, > 110 mg/dL) or the presence of chylomicrons.

Clinical Diagnosis

The data reviewed in each case included history and physical examination findings, radiographic images, laboratory values, inpatient and outpatient charts, as well as hospital discharge summaries. The clinical diagnoses were based on the consensus of two experts in pleural disease (S.A.S. and P.D.).

PFA

The PFA included appearance, nucleated cell count with differential cell count, pH, and total protein, lactate dehydrogenase (LDH), glucose, amylase, and triglyceride concentrations, and the presence of chylomicrons. The cell count was performed using a body fluid analyzer (IQ 200 Automated Body Fluid Analyzer; International Remote Imaging Systems International, Inc; Chatsworth, CA). The cell count differentials were prepared on slides and were cytocentrifuged, and 100 cells were counted for the differential count after Wright staining. A chylomicron screen was performed (Hydrasys Electrophoresis; Sebia; Norcross, Ga). All other components of the PFA were measured using an analyzer (DXC analyzer; Beckman Coulter; Brea, CA). Pleural fluid pH was measured using an arterial blood gas analyzer.

Definition of Terms

Transudates: These effusions have a pleural fluid/serum total protein ratio of ≤ 0.5 and an LDH concentration of ≤ 160 IU/L (0.67 of the upper limit of the normal serum LDH concentration at our institution).

Exudates: Concordant exudates are effusions with both a protein ratio of > 0.5 and an LDH concentration of > 160 IU/L. Discordant exudates are effusions classified as exudates by either LDH or protein concentration criterion, but not both. We further subclassified each effusion based on these two criteria. Protein-discordant exudates have a pleural fluid/serum total protein ratio of > 0.50 and an LDH concentration of ≤ 160 IU/L. LDH-discordant exudates are effusions with a pleural fluid/serum total protein ratio of ≤ 0.5 and an LDH concentration of > 160 IU/L. Lymphocyte predominance indicates an effusion with > 50% lymphocytes.

*From the Division of Pulmonary, Critical Care, Allergy, and Sleep Medicine, Medical University of South Carolina, Charleston, SC.

The authors have reported to the ACCP that no significant conflicts of interest exist with any companies/organizations whose products or services may be discussed in this article.

Manuscript received September 11, 2007; revision accepted January 23, 2008.

Correspondence to: Vishal Agrawal, MD, Division of Pulmonary, Critical Care, Allergy, and Sleep Medicine, Medical University of South Carolina, STE 812CSB, 96 Jonathan Lucas St, Charleston, SC 29425; e-mail: agrawav@musc.edu

DOI: 10.1378/chest.07-2232

RESULTS

A total of 876 PFAs were reviewed. Of these, triglyceride levels were measured in 391 of the effusions. A chylomicron screen had been performed in 22 of the effusions. In 10 effusions, only the triglyceride concentrations were > 110 mg/dL, and in 8 effusions only chylomicrons were present, 4 of which were positive for elevated triglyceride concentrations and for chylomicrons. These effusions were obtained from 21 patients. Patient 21 had bilateral effusions (Table 1). Thirteen of the 22 effusions (60%) were right sided. Ten patients (48%) were outpatients, and 11 patients (52%) were inpatients. There were 10 men and 11 women with an age range of 24 to 76 years. There were no effusions in the postoperative or early posttrauma period.

Transudates

The first seven patients listed in Table 1 had transudative effusions. Patients 1 and 2 presented with congestive heart failure as well as a second diagnosis known to cause chyle leakage or lymphoma and pancreatic cancer, respectively. The pleural effusions in patients 3 and 4 were secondary to cirrhosis. The ascitic fluid associated with patients 3 and 4 was chylous by gross appearance (patient 4) and had an elevated triglyceride level of 122 mg/dL (patient 5). The chyle leakage in patient 5 was secondary to remote radiation therapy for Hodgkin lymphoma with constrictive pericarditis years later. Patient 6 had multiple etiologies for the effusion, including congestive heart failure, a resolving uncomplicated parapneumonic effusion, and a chyle leak. Patient 7 had a chylomicron-positive effusion in the setting of congestive heart failure and volume overload. No other cause for a chyle leak could be identified.

Concordant Exudates

The chylous effusion associated with patient 8 was likely due to lymphoma; however, he was also being treated for pneumonia at the time of thoracentesis.

Patient 9 had a tuberculous cholesterol effusion with the development of a chyle leak. This effusion had a triglyceride/cholesterol ratio of > 1.0 with the presence of chylomicrons. Prior thoracentesis did not reveal chylomicrons, indicating the development of a chyle leak in a preexisting cholesterol effusion.

Patient 10 presented with an empyema with an elevated triglyceride level, but the fluid was negative for chylomicrons. This was a neutrophil-predominant effusion and was unlikely to have been caused by a chyle leak. This patient eventually underwent decortication.