



THORACENTESIS: EXUDATE OR TRANSUDATE

Don Steinert MA, RRT, MT, CLS

Patients requiring a thoracentesis are probably not seen that often by the average respiratory therapist. When we do see these patients, they are usually quite ill. Often times the cardiopulmonary condition, or other condition, causing the accumulation of fluid in the pleural cavity is a mystery on admission, and only after a few days in the hospital with numerous tests is the real cause identified and treated. Before we look at how laboratory data helps identify the cause of pleural fluid accumulation, let's look at the identifying characteristics of the pleural effusion itself. Pleuritic chest pain, sometimes with chest pressure, along with dyspnea and cough, are the most common signs of pleural effusion. It may take a fluid accumulation of more than 500 ml before these symptoms are presented by the patient or identified by the health care provider. At this level of fluid accumulation the therapist will often hear diminished breath sounds, with dullness to percussion, as well as reduced tactile and vocal fremitus and occasionally a pleural friction rub if inflammation is present.

Thoracentesis is done to identify etiology and to relieve pressure on the lungs, thus reducing dyspnea

Once the presence of a pleural effusion is suspected, a chest x-ray is necessary. With some pleural effusions, especially with subpulmonic location (layering below the lung but above the hemidiaphragm), a lateral Decubitus film is useful. Chest CT can also be helpful in distinguishing between parenchymal and pleural diseases as well as pleural thickening.

Thoracentesis is done to identify etiology and to relieve pressure on the lungs, thus reducing dyspnea. The laboratory evaluation can, and often does, involve cytology, histology, and microbiological, as well as chemical analysis. Specifically preserved aliquots of the fluid must be obtained in the following manner: (1) heparinized for culture, (2) EDTA for microscopy, (3) sodium fluorescein (NaF) for glucose and lactate, and (4) untreated for further biochemical testing.

The outer layer of the pleural sac, the parietal layer, is served by the systemic circulation; the inner, visceral layer, by the bronchial circulation. Pleural fluid is essentially interstitial fluid of the systemic circulation. With normal conditions there is 3-20 ml of pleural fluid in the pleural space. In disease states this fluid accumulation can exceed 1500 milliliters! The fluid exits by drainage into the lymphatics of the visceral pleura and the visceral circulation. Any alteration in the rate of formation or removal of the pleural fluid will affect the volume, causing an effusion.

A transudate develops when fluid from the pulmonary capillaries moves into the pleural space or when systemic factors that influence the formation and absorption of pleural fluid are altered. Such things as low serum proteins and increased pulmonary venous pressure can do this. The fluid is generally thin and watery, containing a few blood cells and little protein. The WBC count is low, as is the LDH (<200 IU) and specific gravity. The pleural surfaces are not involved in producing the transudate. In contrast, an exudate develops when the pleural surfaces are diseased or when local factors that influence the formation and absorption of fluid are altered. The fluid has a high protein content and a great deal of cellular debris as well as a high specific gravity and elevated LDH. Other laboratory values are also of use in differentiating disease states associated with pleural effusions; for instance, a decrease in glucose (less than 50% of normal serum value) would suggest infection or inflammation. An increase in amylase compared with that of serum suggests pancreatitis. Grossly elevated triglyceride levels (2-10 times serum values) could indicate chylothorax. A pH less than 7.2 suggests infection, and pH greater than 7.4 suggests malignancy. The number and type of white blood cells can also be useful in differentiating clinical conditions. An increase in neutrophils would indicate bacterial infection or inflammation. Increase in eosinophils would indicate allergic reactions or parasitic infection. Increase in basophils might indicate a myeloproliferative disorder. Monocyte increase would indicate chronic infections or malignancies. Lymphocyte increases would indicate viral infections, and red blood cells is an obvious sign of bleeding.

Some specific conditions associated with transudates are: *Congestive heart failure* - Fluid usually straw colored, with low white blood cell counts (<500 cells/mm³) and a mononuclear cell predominance. *Cirrhosis, Nephrotic Syndrome, Hepatic Hydrothorax* - Low cell counts with lymphocytes predominate. Effusion occurs usually on the right side.

Some specific conditions associated with exudates are: *Parapneumonic Effusion* - Bacterial pneumonias are associated with pleural effusions as often as 50% of the time. Empyema (finding of gross pus in the pleural space). High white blood cell counts with polymorphonuclear predominance, glucose <30 mg/dl, and high LDH (>500 units/dl). *Malignant Effusions* - the second most common cause of exudative pleural effusions. A mononuclear predominant exudate (average 2500 cells/mm³), with an average red blood cell count of 40,000 cells/mm³, normal glucose (>60 mg/dl) and positive cytology.

Education Updates... *Continued from previous page*

ty for the registry exam system. The 2007 deadline has come and gone. Now the NBRC has granted an amnesty period, extending that deadline until the end of February 2009. They offered little explanation for this magnanimous gesture, but do state that from this point on, there will be no further extension of the deadline.

On another note, educators have asked if questions on the NBRC entry level and registry exams will reflect the most current CPR guidelines for health care providers. The answer is "yes." The NBRC has stated that the 2005 CPR guidelines for health care providers will be incorporated into both the entry-level and advanced level exams effective June 2008.

That All-Important Baccalaureate Degree

Respiratory therapists have officially joined the rank of "professionals." Baccalaureate prepared RRTs can now qualify as commissioned officers, along with nurses, pharmacists, and other similarly educated health care providers within the Public Health Service. Make no mistake about it. This recognition didn't happen all by itself. It's the result of years of behind-the-scenes effort and advocacy on the part of the AARC.

There's also another movement afoot to allow services provided by registered respiratory therapists with bachelor's degrees to be compensated under Medicare Part B when these services are performed under the umbrella of a physician practice. Bills have been introduced in both the House and Senate. Educators should be actively supporting this legislation. No matter which way this goes, I think we can see the handwriting on the wall. The winds of change are pointing to that all important bachelor's degree as a critical key to our professional future.

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Effusion secondary to pulmonary embolism - Usually bloody and associated with pleurisy and dyspnea.

Tuberculous Effusion - These are predominantly lymphocytic exudate. Glucose may be low (<60 mg/dl) and adenosine deaminase usually elevated (>70 IU/l). Pleural fluid smears for acid fast organisms are rarely positive but cultures are positive approximately 25% of the time. However, thoracoscopic pleural biopsy is positive 80% of the time.

Effusions secondary to Collagen Vascular Disease - Effusions secondary to rheumatoid arthritis are predominantly mononuclear cell exudates, typically with low glucose levels (<10 mg/dl), high titers of rheumatoid factor (>640) and cloudy appearance (pseudochylous or cholesterol effusions).

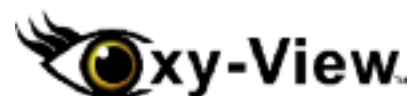
Atelectasis is a common cause of small to moderate effusions. Frequently they are seen postoperatively or with prolonged bed rest. There are no diagnostic criteria, they have normal glucose with WBC counts of 1000-2000 cells/mm³ with mononuclear cell predominance.

As you can see, causes for pleural effusions are numerous and their identification not always clear, but a classification based on the type of effusion is useful, and in fact necessary for proper diagnosis of the patient's condition.

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