

Pleural Effusion in a Diver with a Past History of Major Trauma

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Analysis of pleural aspirate is useful in determining the etiology of pleural cavity fluid collections. Pleural effusions associated with pancreatic disease are known to have elevated amylase enzyme levels. Other supplemental findings can help in making a more specific and quicker diagnosis. This article describes the case of a patient with a past history of extensive abdominal trauma and subsequent recurrent lung infections who experienced pleuritic chest pain after a deep sea dive. He eventually was found to have a pancreaticopleural fistula. The evaluation and treatment of pancreaticopleural fistulae are discussed.

CASE PRESENTATION

Patient Presentation and History

A 56-year-old man who was an underwater diving specialist presented to our medical service with a 5-day history of cough, rusty-colored sputum, fever with chills, nausea, myalgia, fatigue, and pleuritic left-sided chest pain. He had a history of a motor vehicle accident 2 years previously. Injuries sustained during the accident had included a lacerated liver and splenic rupture requiring surgical repair and splenectomy, a fractured femur, and a fractured pelvis. In addition, he had traumatic rupture of the pancreas associated with recurrent left-sided pneumonia requiring thoracotomy with lung decortication. Ten weeks prior to the current presentation, he had been discharged from a hospitalization elsewhere for treatment of recurrent pneumonia.

Physical and Laboratory Examination

Physical examination showed a febrile (101°F) man in no apparent distress. Examination of the chest showed point tenderness along the seventh and eighth ribs with decreased breath sounds and dullness over the left lower lobe. His blood counts showed a leukocyte count of $19.0 \times 10^3/\text{mm}^3$, with a marked left shift. An attempt at thoracentesis without radiographic imaging yielded no fluid. Thoracentesis guided by ultrasonography produced a small volume of dirty-looking fluid with elevated pleural fluid amylase

(> 10,000 U/L) and lipase (> 9000 U/L) levels with normal corresponding serum levels. The pleural fluid lactate dehydrogenase level was 708 U/L with normal serum levels. Results of pleural fluid cytology were negative and cultures were sterile. A peritoneal tap at the same time showed fluid containing elevated amylase (549 U/L) and lipase (2437 U/L).

Imaging Studies

Chest radiographs were inconclusive except for showing a left-sided pleural effusion. Computed tomography (CT) of the chest showed a left-sided loculated effusion in the posterolateral part of thorax with pleural thickening and no parenchymal infiltrate. Abdominal CT revealed a pseudocyst in the tail of pancreas continuous with the splenic fossa. The cyst contained loculated fluid that, in turn, was in direct connection with loculated fluid in the left side of the chest. Endoscopic retrograde cholangiopancreatography (ERCP) was negative at this time. Esophagogastroduodenoscopy performed to rule out an upper gastrointestinal bleed revealed grade I esophagitis and Barrett's esophagus.

Treatment

The patient was placed on a 3-week trial of conservative management with outpatient octreotide therapy, but there was no improvement. As a result, an exploratory laparotomy was performed. The postoperative diagnosis was that of a diaphragmatic tear with pancreaticopleural and gastropancreatic fistulae. During the period when he was awaiting definitive surgery, the patient reported that some months after recovery from his motor vehicle accident, he again had resumed scuba diving. During a dive in which he submerged to

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between 50 and 100 ft, he experienced sharp, left-sided chest pain. Upon surfacing, he expectorated blood and tissue. After the dive, he had recurrent episodes of left chest pain.

Repair of the fistulae and diaphragmatic tear together with Roux-Y pancreaticojejunostomy was carried out. The postoperative course was complicated by prolonged ileus, a functional but slow jejunostomy with severe esophageal reflux, a left upper extremity deep vein thrombosis, and a central line infection. The patient was discharged to home in fair condition almost 4 weeks after surgery.

DISCUSSION

Epidemiology

Abnormal communications between the abdominal and thoracic cavities are rare causes of recurrent pneumonia and pleural effusions. The most common complication of surgery involving the pancreas is fistulae, which occur in 20% to 40% of patients who sustain an isolated pancreatic intraoperative injury and in 26% to 35% of patients who sustain a combined pancreaticoduodenal intraoperative injury. Pancreaticopleural fistulae are uncommon.¹

Pathophysiology

The mechanism of pancreaticopleural fistula is thought to be rupture of a pancreatic duct or pseudocyst accompanied by acquired diaphragmatic defects.² In this patient, wet-suit diving to depths approaching 100 ft probably acted to force the poorly compressible pseudocyst fluid through the prior surgical repair and into the abdomen, and then through the surgically repaired diaphragm into the pleural cavity.

Diagnosis

Analysis of the pleural fluid can help to narrow the differential diagnosis of a pleural effusion. A pleural fluid amylase level that is higher than the upper limit of normal for serum amylase levels (ie, a pleural fluid amylase to serum amylase ratio of > 1) usually narrows the differential diagnosis to acute or chronic pancreatitis, esophageal rupture, pneumonia, ruptured ectopic pregnancy, hydronephrosis, or cirrhosis. A pancreatic origin of amylase is confirmed by the presence of pancreatic isoenzymes, and malignancy and esophageal rupture are characterized by the finding of salivary amylase isoenzymes.³ If the diagnosis is uncertain, other findings from the pleural examination may be informative. The present case demonstrates that lipase levels obtained at the initial thoracentesis may be helpful in focusing the search for an etiology. It is recom-

mended that pleural fluid amylase content be measured in any case of exudative pleural effusion of unknown etiology.⁴ In addition, ERCP and CT scan (both chest and abdomen) are useful in demonstrating pancreaticopleural fistulae.

Treatment

Pancreatic fistulae usually resolve with conservative management. The vast majority are minor (drainage < 200 mL/day) and spontaneously resolve within 2 weeks of injury, provided adequate external drainage is provided.⁵ High-output fistulae (drainage > 700 mL/day) are rare and generally require longer periods of external drainage or, preferably, surgical intervention.⁵ Conservative measures usually precede surgical intervention and include repeated aspiration and administration of diuretics⁶; adequate nutritional support (either with a low fat/high pH elemental feeding formula given by a feeding jejunostomy created at the time of the initial laparotomy or total parenteral nutrition); and somatostatin analogue therapy (eg, octreotide acetate). Conservative therapy must be accompanied by eradication of any infection, pancreatic duct obstruction, or stricture.⁵ If ductal disruption is present, endoscopically placed stents can be effective in the short term.⁶ Surgical remedies include resection of the involved pancreas or procedures creating internal drainage into stomach or a defunctionalized limb of jejunum.⁷

CONCLUSION

The case patient experienced recurrent lung infections owing to a pancreaticopleural fistula created as a result of being in water under high barometric pressure. The pressure sustained during a scuba dive likely forced fluid from a pancreatic pseudocyst into his abdomen and thorax. Persons with cysts or pseudocysts of the pancreas incur significant risk with deep dives because of tissue compression.

Elevated levels of amylase are a recognized finding that can help point to a pancreatic origin of a pleural effusion. In this case, lipase also was markedly elevated, and checking a lipase level may be useful in cases of recurrent pleural effusion of unknown or unclear etiology. A vast majority of pancreaticopleural fistulae disappear spontaneously; the remainder usually require surgical intervention of some sort. In both settings, temporary yet adequate nutritional support and external drainage are required. **HP**

REFERENCES

1. Pleskovic L, Pegan V. [Pancreatic pleural effusion.

- Diagnosis and therapy.] [Article in Slovene.] *Acta Chir Jugosl* 1990;37:229-37.
- Ondrejka P, Faller J, Siket F, et al. Isolated massive pleural effusion caused by pancreatico-pleural fistula. *Z Gastroenterol* 2000;38:583-5.
 - Sahn SA. Diagnostic evaluation of a pleural effusion. Available at www.uptodate.com. Last updated on 17 Mar 2003. Accessed on 3 Mar 2004.
 - Cooper CB, Bardsley PA, Rao SS, Collins MC. Pleural effusions and pancreatico-pleural fistulae associated with asymptomatic pancreatic disease. *Br J Dis Chest* 1988;82:315-20.
 - Wisner DH, Hoyt DB. Definitive care phase: abdominal injuries. In: Greenfield LJ, Mulholland MW, Oldham K, editors. *Surgery: scientific principles and practice*. 2nd ed. Philadelphia: Lippincott-Raven; 1997:346-50
 - Freedman SD. Complications of chronic pancreatitis. Available at www.uptodate.com. Last updated on 19 Aug 2003. Accessed on 3 Mar 2004.
 - Jurkovich GJ. Duodenum and pancreas. In: Mattox KL, Feliciano DV, Moore EE, editors. *Trauma*. 4th ed. New York: McGraw-Hill; 2000:735-62.

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