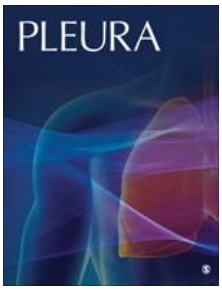

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Review Article

Transudative Empyema - Spontaneous Bacterial Empyema

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Abstract:
Spontaneous bacterial empyema(SBEM) is the spontaneous infection of hepatic hydrothorax. It is an underdiagnosed condition associated with high mortality and recurrence. The reasons for underdiagnosing this condition are reluctance in performing thoracentesis, difficulty in establishing the true nature of the pleural effusion and empiric use of antibiotics in a decompensated cirrhotic patient. The two proposed theories for its pathogenesis are the transmigration of infected ascitic fluid into the pleural space and infection of the hepatic hydrothorax by the hematogenous route. SBEM is a relative contraindication for chest tube placement and can be successfully treated with appropriate antibiotics alone. Alteration in nomenclature, better diagnostic criteria and establishment of evidence based guidelines on management and prophylaxis could reduce the mortality and morbidity associated with this disease.

Keywords: Empyema, Hydrothorax, Transudative pleural effusion

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Introduction:

Spontaneous bacterial empyema(SBEM) is the natural infection of a hepatic hydrothorax. 2 -2.4% of patients with cirrhosis and 13 -16% of patients with hepatic hydrothorax are estimated to have SBEM [1, 2, 3]. While Hippocrates first described empyema around 400 BC, Flaum reported the first case of SBEM in 1976[4]. Spontaneous bacterial empyema is defined by pleural fluid polymorphonuclear(PMN) count > 250 cells/uL with a positive culture or a pleural fluid PMN count > 500 cells/uL with a negative culture - following exclusion of parapneumonic infections (Box. 1). In their study, Xiol et al. excluded parapneumonic infections by documenting: absence of radiological evidence of pneumonia, history of a pleural effusion and transudate characteristics during current infection[3].

Underdiagnosis:

The actual incidence of SBEM may be higher than reported due to under-diagnosis. The diagnosis of SBEM is overlooked by the immediate initiation of empiric antibiotics in patients with cirrhosis and fever or hepatic encephalopathy for suspicion of spontaneous bacterial peritonitis(SBP). Although Xiol et al. reported only a 1% rate of pneumothorax on diagnostic thoracentesis, physicians continue to be apprehensive about performing thoracentesis in a cirrhotic patient with persistent pleural effusion[5]. The study demonstrated 15% of the patients to have SBEM[5]. The exclusion of a parapneumonic infection according to the 1990 diagnostic criteria for SBEM can be problematic**.** Light's criteria were applied for diagnosing SBEM in all available studies in medical literature. This criteria misclassifies 18% of hepatic hydrothoraces to be exudates[6]. Light recommended using pleural fluid serum albumin ratio (pleural fluid to serum albumin ratio < 0.6) to reclassify pleural effusions which met exudative criteria by a small margin[7].

Pathogenesis:

The common pathogens isolated from pleural fluid in patients with SBEM are similar to those ordinarily grown in ascitic fluid cultures in patients with SBP. The proposed mechanism for the development of SBEM is the transmigration of infected fluid from the peritoneal cavity to the pleural space (Figure 1), commonly the right side, through the defects in the diaphragm which are weakened as a result of hypoalbuminemia, malnutrition, and hypercatabolic state. The evidence supporting this mechanism is that 54 - 58% of SBEM patients have concomitant SBP[1, 2, 3]. Xiol et al. demonstrated the growth of identical organisms in both pleural and ascitic fluid among the culture positive SBEM patients. Studies have reported 34% - 38% patients with SBEM and concurrent ascites did not have SBP[1, 8]. Hematogenous spread of gut bacteria to the pleural cavity was proposed to explain SBEM in patients without SBP. A combination of bacterial overgrowth and translocation, depressed hepatic reticuloendothelial system and low concentrations of C3, C4 and opsonic activity levels in the pleural fluid was thought to explain this theory[9, 10]. Xiol et al. could not prove SBP in six out of the ten patients with SBEM

Box 1: Definition of Spontaneous bacterial empyema

Definition of Spontaneous Bacterial Empyema
Negative pleural fluid culture with Polymorphonuclear leukocytes (PMN) count > 500 cells/mm_3 OR Positive pleural fluid culture with PMN count > 250 cells/m_3 AND Exclusion of parapneumonic infections

because ascitic fluid could not be obtained for analysis. Three out of the remaining four had negative blood cultures. The remaining one patient grew K. pneumonia (a common lung pathogen) in blood. Whether infection in SBEM is truly spontaneous is thrown into doubt by Rubenstein et al.'s work demonstrating the transmigration of radioisotope from the peritoneal to the pleural cavity in the absence of clinical ascites[11]. Patients with transudate pleural fluid due to causes other than liver disease failed to demonstrate transmigration of ascitic fluid to the pleural cavity. This study explains the lack of sufficient medical literature supporting the presence of SBEM among patients with congestive heart failure and nephrotic syndrome, despite their high incidence[12].

Treatment:

SBEM does not conform to the classical definition of empyema or its management; although SBEM can rarely turn into an empyema, pus in the pleural cavity, if neglected. Chest tube insertion, the least aggressive management for empyema, is relatively contra-indicated in SBEM. Studies have uniformly proven that SBEM can be successfully treated with antibiotics alone. The term spontaneous bacterial pleuritis, which was intermittently used in the past, would more aptly describe this condition and help prevent improper management[13, 14]. The mortality and recurrence rates of patients with SBEM were notably 38% and 25%, respectively[1,3]. These high figures prompt further questions: Is there a role for antibiotic prophylaxis in SBEM similar to SBP?. In the absence of SBP, should every symptomatic cirrhotic patient with a pleural effusion get a thoracentesis to exclude SBEM?.

Conclusion:

SBEM is a relatively common condition among cirrhotic patients, despite underdiagnosis. There is a necessity to better understand and define this disease because of the high mortality and recurrence rates associated with it. Change of nomenclature, better diagnostic criteria, and the establishment of evidence-based guidelines regarding management and prophylaxis could successfully reduce the mortality and morbidity caused by SBEM.

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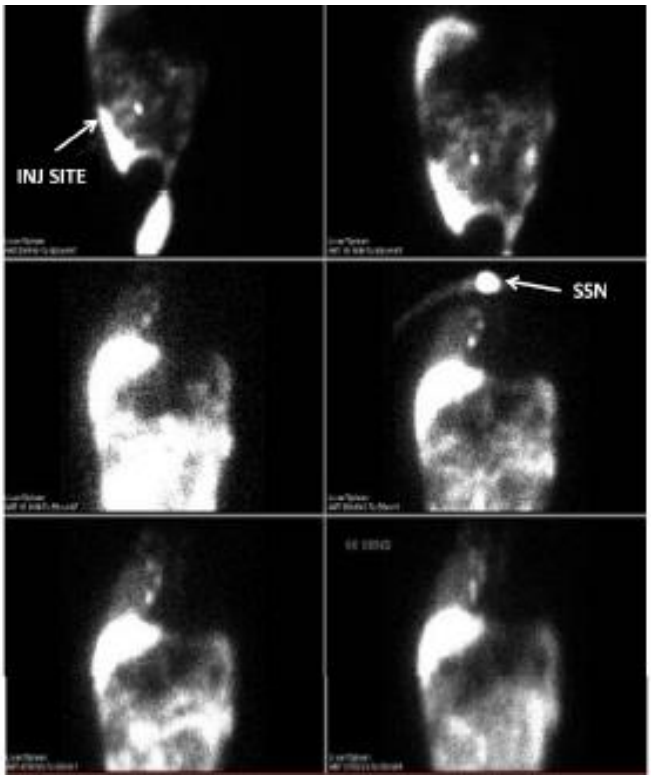

Figure 1: Sulfur colloid scan demonstrating the transmigration of ascitic fluid into the pleural cavity.
INJ SITE – Administration site of the sulfur colloid
SSN – Suprasternal notch

Box 2: Take Home Points

SBEM has been noted in 2% of cirrhotic patients

The estimated mortality rate is 30%.

The proposed mechanisms of SBEM are

- Spontaneous bacterial infection of hepatic hydrothorax(similar to SBP)
- Flow of infected ascites into the pleural cavity (more common)

40% of SBEM cases may not be associated with SBP.

The common pathogens isolated from pleural fluid

- E. coli
- K. pneumonia

SBEM can be effectively treated with antibiotics and is a relative contraindication to chest tube insertion.

Complications associated with chest tube insertion:

- Electrolyte imbalance
- Protein loss
- Renal failure
- Prolonged chest tube placement

Frank pus in the pleural cavity is the only indication for chest tube insertion.

Factors associated with increased in-hospital mortality

- Initial ICU admission
- High MELD-Na score
- Initial inappropriate antibiotic treatment

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