Sister Leena’s Sign Revisited: Colopleural Fistula Following Rib Fractures

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Abstract

In 2007, the term “Sister Leena’s Sign” was coined after the diagnosis of colopleural fistula was made clinically. A case report and review of current literature and treatment options is reported.

KEYWORDS: Colopleural, Fistula, Rib fractures
Introduction:

In 2007, the term “Sister Leena’s Sign” was coined after a diagnosis of a colopleural fistula was identified clinically by an observant nurse. She had noted the feculent nature of the drainage of a patient’s chest tube, and that it varied markedly with the person’s oral intake.1

The case presented illustrates a colopleural fistula that resulted from rib fractures. Colopleural fistulas are a rare entity that may occur from trauma, advanced or neglected intraabdominal disease, operative interventions, as well as congenital diaphragmatic hernias with incarceration. This case appears to have occurred following rib fractures and did not present as the initial diagnosis. Keys to diagnosis, options for treatment and review of recent case reports are included.

Case Report

EMS was dispatched to the home of a 52-year-old male with complaints of shortness of breath and decreased mental status. The patient had a history of coronary artery disease treated by bypass grafting, atrial arrhythmias and substance abuse. A history of a fall several weeks prior to this episode was documented. The patient was hypotensive and tachycardic on emergency department evaluation. A large right hydropneumothorax with mediastinal shift to the left and rib fractures were identified on chest x-ray (Figure 1). A CT scan had also been obtained which confirmed the above findings. Thickened pleural fluid was noted by Housefield units as well as presence of the right colon underneath the right diaphragm similar to Chilaïditis syndrome. A right chest tube was placed and returned cloudy fluid with resolution of the pneumothorax. The initial white blood count was over 30,000/uL. Pleural fluid culture grew klebsiella species and the working diagnosis was a fall causing rib fractures with secondary pneumonia and early empyema.

Treatment included chest tube drainage, intravenous fluids, antibiotics, intensive
care unit admission, and treatment for atrial arrhythmias and substance abuse. The patient’s signs of sepsis improved. He was able to tolerate a diet with good gastrointestinal function. His white blood cell count normalized.

Six days into his hospital course, he developed an elevated white blood count at 20,000/μL and the character of the chest tube fluid had changed, suggesting fecal material. The volume of the fluid had also increased. An esophagram was normal. Vegetable fiber was seen on microscopic analysis of the chest tube fluid and a clinical diagnosis of colonic perforation across the diaphragm into the pleural cavity was made.

Laparotomy was performed identifying a 2 centimeter defect in the right, lower, posterior portion of the diaphragm near the rib fractures, consistent with either Bochdalek hernia defect or laceration of the diaphragm secondary to rib fractures. The defect was well defined. This contained a small portion of colon that had become incarcerated similar to a Richter’s hernia causing a perforation and thus the fistula. The colonic defect was repaired primarily as there was no intraabdominal contamination. The diaphragmatic opening was closed in a two layer technique. Thoracoscopy and saline irrigation of the chest were performed to clear out the pleural debris.

The patient’s postoperative course was characterized by atrial arrhythmias similar to his preoperative course. Mechanical ventilation was utilized for two days. He was transferred to a chronic care facility two weeks following surgery and then discharged home one month after surgery. After some interruption in care and premature removal of the empyema tube, he developed a secondary pleural fluid collection requiring operative drainage two months after the original procedure. He was able to return to home. Follow-up chest x-ray demonstrated postoperative changes at four months post-treatment.

Discussion
Colopleural fistula is a rare event. We postulate in this case that the etiology was likely a laceration of the diaphragm related to his rib fractures. The fractures initially caused pneumothorax, secondary pneumonia and evolving early empyema. Due to negative pressure within the chest and later chest tube suction, we believe this promoted movement of the colon to the hernia defect, subsequent incarceration, perforation and fistula formation.

A review of his chest x-ray two months prior to this incident identified a normal appearing chest cavity with absence of colon along the right lobe of the liver and subdiaphragmatic position. Thus, we feel the possibility of a Bochdalek hernia is unlikely.

Colopleural fistulas have been reported from a number of etiologies including pregnancy\textsuperscript{1,2} and penetrating trauma to the chest in which an initial diaphragmatic injury was not identified.\textsuperscript{3} Postoperative issues with diaphragmatic injury or advanced intraabdominal disease causing diaphragmatic penetration can occur from hepatic, small bowel and colonic disorders.\textsuperscript{4,5,6} Strangulated and incarcerated Bochdalek or Morgagni hernias in adults are also possibilities.\textsuperscript{7}

The diagnosis can be confirmed by barium studies to identify the fistula if needed. Radin points out that mediastinal shift without diaphragmatic depression would suggest involvement of the diaphragm or diaphragmatic injury.\textsuperscript{3} Treatment of the colopleural fistula is dependent upon the etiology. In our case, repair of the diaphragmatic defect and primary repair of the colon was performed. Use of colostomy or GI tract diversion may be required depending on the extent of intraperitoneal contamination. Minimal intraperitoneal infection may make primary repair or anastomosis possible. Treatment of the chest component may involve simple chest tube drainage alone or pleural debridement or decortication. Thoracoscopy may also play a role, either at the time of the initial intraabdominal surgery or subsequently. Conservative management of a colopleural fistula by interventional methods has been reported by Komatsu in a
postoperative situation following diaphragmatic hernia repair.\textsuperscript{13}

From a review of case reports, it appears that survival is high from this process if recognized early and is probably more dependent upon the intraperitoneal component of the process rather than the colopleural fistula alone. Table 1 reviews recent case reports.

In summary, colopleural fistula, which is rare, can be easily identified from the character of the chest tube fluid, Sister Leena’s sign, and simple microscopic fluid analysis. Treatment of the intraabdominal component is the mainstay of therapy and drainage of the chest in some form is required.

References
1. Ibrahim W H, Thomas L, Sister Leena’s Sign: A Sign that may be Useful in Differentiating Colopleural Fistula (Fecal Empyema) from Usual Empyema. Chest 2007; 131: 1616-1617


Table 1. Summary of colopleural fistula reports

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Fistula Etiology</th>
<th>Treatment</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trauma</strong></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Radin et al&lt;sup&gt;3&lt;/sup&gt;</td>
<td>1985</td>
<td>Stab wound</td>
<td>Colectomy, Chest Tube</td>
<td>Not Reported</td>
</tr>
<tr>
<td>Reddy et al&lt;sup&gt;9&lt;/sup&gt;</td>
<td>1989</td>
<td>Stab Wound</td>
<td>Colectomy, Colostomy, Pleural Decortication</td>
<td>Survived</td>
</tr>
<tr>
<td>Seelig et al&lt;sup&gt;10&lt;/sup&gt;</td>
<td>1999</td>
<td>Stab Wound</td>
<td>Left Colectomy, Chest Lavage, Chest Tube</td>
<td>Survived</td>
</tr>
<tr>
<td>Mattei et al&lt;sup&gt;11&lt;/sup&gt;</td>
<td>1992</td>
<td>Stab Wound</td>
<td>Colostomy, Decortication</td>
<td>Survived</td>
</tr>
<tr>
<td>Hahn et al&lt;sup&gt;12&lt;/sup&gt;</td>
<td>1990</td>
<td>Fall With Rib Fractures</td>
<td>Primary Repair</td>
<td>Survived</td>
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<td><strong>Operative Complications</strong></td>
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<td></td>
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<tr>
<td>El Hiday et al&lt;sup&gt;5&lt;/sup&gt;</td>
<td>2008</td>
<td>Hepatic surgery</td>
<td>Colon Resection</td>
<td>Survived</td>
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<tr>
<td>Olubaniyi et al&lt;sup&gt;4&lt;/sup&gt;</td>
<td>2006</td>
<td>Pneumonectomy and Diaphragm Reconstructor</td>
<td>Colon Resection, Thoracoplasty, Latissimus Dorsi Flap</td>
<td>Survived</td>
</tr>
<tr>
<td>Komatsu&lt;sup&gt;13&lt;/sup&gt;</td>
<td>2010</td>
<td>Hernia Repair, Right Colon Injury</td>
<td>Interventional methods</td>
<td>Survived</td>
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<td><strong>Hernia</strong></td>
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<td></td>
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<tr>
<td>Sinha et al&lt;sup&gt;7&lt;/sup&gt;</td>
<td>1989</td>
<td>Bochdalek Hernia</td>
<td>Colostomy, chest Drainage</td>
<td>Survived</td>
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<tr>
<td><strong>Intraabdominal Disease</strong></td>
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<td>Papagiannopoulos et al&lt;sup&gt;6&lt;/sup&gt;</td>
<td>2004</td>
<td>Perforated Diverticulitis</td>
<td>Colon Resection, Loop Ileostomy, Chest Drainage</td>
<td>Survived</td>
</tr>
<tr>
<td>Vasu Jasjet Saluja et al&lt;sup&gt;8&lt;/sup&gt;</td>
<td>2006</td>
<td>Diverticulitis</td>
<td>Colostomy, Colon Resection</td>
<td>Died</td>
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<td><strong>Pregnant/Postpartum</strong></td>
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<tr>
<td>Ibrahim et al&lt;sup&gt;1&lt;/sup&gt;</td>
<td>2007</td>
<td>Pregnancy?</td>
<td>Colon Resection, Decortication</td>
<td>Survived</td>
</tr>
<tr>
<td>Lacayo et al&lt;sup&gt;2&lt;/sup&gt;</td>
<td>1993</td>
<td>Pregnancy, History of Stab Wound</td>
<td>Colon Resection, Primary Anastomosis</td>
<td>Not Reported</td>
</tr>
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**Figure 1.** Presenting chest x-ray showing pneumothorax, tension component and pleural fluid.
Figure 2. Reconstructed CT showing colon beneath the right diaphragm.