**A case of thoracoabdominal splenosis**

**Samuel R. Kosydar, BA**, **Paul J Sanchirico, MD**, **David C Pfeiffer, PhD**

**a** WWAMI Medical Education Program (MD), University of Washington School of Medicine, 1959 NE Pacific St, Seattle, WA 98195, USA  
**b** St Joseph Regional Medical Center, 415 6th St, Lewiston, ID 83501, USA  
**c** WWAMI Medical Education Program and Department of Biological Sciences, University of Idaho, 875 Perimeter Drive, Moscow, ID 83844-3051, USA

**A R T I C L E   I N F O**

Article history:  
Received 18 September 2019  
Revised 10 October 2019  
Accepted 11 October 2019  
Available online 8 November 2019

Keywords:  
Splenosis  
Diaphragmatic defect  
Thorax  
Abdomen  
CT

**A B S T R A C T**

We describe a case of a 38-year-old male with a remote history of motor vehicle trauma who presented to the emergency department with 1-week history of progressively worsening abdominal pain localized to the epigastric region. Patient history included splenectomy. Computerized tomography demonstrated multiple masses in the left pleural space as well as masses continuous with the diaphragm and abdominal wall in the left upper quadrant. In addition, a lobulated mass was identified in the right upper quadrant along the anterior right hepatic lobe. A diaphragmatic defect was noted containing splenic tissue. A diagnosis of splenosis was made. Disseminated splenosis presenting in both the thorax and abdomen is rare and poorly documented. This case serves to further illuminate this condition.

© 2019 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license. ([http://creativecommons.org/licenses/by-nc-nd/4.0/](http://creativecommons.org/licenses/by-nc-nd/4.0/))

**Introduction**

Splenosis is characterized by the ectopic transplantation of splenic tissue, often as a result of trauma [1]. Splenosis has a different pathophysiology than accessory spleens, which result not from a traumatic etiology but from incomplete fusion of mesenchymal buds during embryogenesis [2]. Accessory spleens are estimated to occur in 10%-30% of the general population [2], while splenosis may be found in about a quarter of patients undergoing splenectomy for trauma [3]. Since splenosis often presents asymptptomatically, it is typically an incidental finding on imaging [4]. The mean time between the injury responsible for splenosis and the actual diagnosis is about 2 decades [5]. Nevertheless, there are reports of splenosis presenting as persistent chest pain [6,7], hemoptysis [8], and bowel obstruction [9]. Although diagnosis via biopsy is the gold standard, imaging informed by a relevant patient history including splenectomy or prior trauma to the spleen, is still acceptable [10].

Splenosis is most prevalent in the abdomen and, much less commonly, in the thorax [6]; here, we report a case of disseminated asymptomatic splenosis localized to the left pleural cavity and upper right and left quadrants in a 38-year-old male with a remote history of motor vehicle trauma.

**Competing Interests:** The authors have declared that no competing interests exist.  
**Corresponding author.**  
E-mail address: dpfeiffer@uidaho.edu (D.C. Pfeiffer).  
[https://doi.org/10.1016/j.radcr.2019.10.017](https://doi.org/10.1016/j.radcr.2019.10.017)  
1930-0433/© 2019 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license. ([http://creativecommons.org/licenses/by-nc-nd/4.0/](http://creativecommons.org/licenses/by-nc-nd/4.0/))
Case report

A 38-year-old male with a history of motor vehicle trauma presented to the emergency department with abdominal pain that had been ongoing for 1 week. The patient reported the pain was localized to the epigastric region, had been progressively worsening, and was not modifiable. That morning, the patient vomited once after eating and noted that his abdominal pain was especially severe. He admitted to having dark but not tarry stools. He denied fever and had no recent travel history. The prior day, the patient had been seen at another ER, where he was diagnosed with acid reflux and prescribed omeprazole.

The patient’s past medical history was notable for splenectomy and 2 skin grafts on his left arm owing to a remote history of motor vehicle trauma. In addition, the patient also had an abdominal wall hernia repair. The patient is an every day smoker and consumes alcohol on a weekly basis.

On physical exam the patient appeared mildly in distress. Pulse was 103, BP 149/88, and temperature 97.9 F. Abdomen was nondistended, soft, but marginally tender to palpation in the epigastric region. The patient was not in respiratory distress; lungs were clear to auscultation bilaterally.

Given the abdominal pain and vomiting, an initial 2-view abdominal x-ray series was conducted and showed multiple air fluid levels in the small bowel (Fig. 1). A follow up computerized tomography (CT) of the abdomen/pelvis with contrast indicated several left-sided chronic rib fractures, nonspecific bowel gas patterns; fluid present in the colon; a prominent appendix, otherwise normal in appearance, with an appendicolith. Small bowel obstruction was suspected. Incidentally, the CT also revealed multiple lobulated masses, identified as splenules, in the left pleural space, the largest of which measured about 4 cm in diameter (Figs. 2 and 3). Splenules, which measured at most 3.3 cm in diameter, were observed continuous with the diaphragm and abdominal wall in the left upper quadrant and were noted traversing a diaphragmatic defect (Figs. 4–6). In addition, a splenule was identified in the right upper quadrant along the anterior right hepatic lobe, no less than 2 cm in diameter.

The patient was provided IV saline (1 L) and ondansetron for his nausea and vomiting. The imaging results were shared with the patient. Discharge instructions included continuation of omeprazole and ondansetron with a referral for additional work up to rule out pleural malignancy.
Discussion

The patient presented in this report is a 38-year-old male who was diagnosed via imaging with disseminated splenosis localized to the left pleural cavity and upper left and right abdominal quadrants. To our best knowledge, disseminated splenosis in both the thorax and abdomen is rare and has only been published once in the English language literature. Sanchez et al at the Hospital Universitario Virgen del Rocio in Spain documented a case of thoracoabdominal splenosis in a 54-year-old male with a history of chest trauma [11]. The largest sponules found in our patient measured up to 3-4 cm in diameter, which is consistent with the literature [12,13].

Splenosis may masquerade as malignancies, including carcinomatosis [14], liver tumor [15], metastatic right adrenal mass [16], lymphoma [17], and lung cancer [18]. When compounded by risk factors like smoking, an accurate diagnosis of a pleural mass as thoracic splenosis can be difficult [19]. Important clues in our case were – patient history of prior trauma and splenectomy, and imaging results showing left-sided chronic rib fractures with diaphragmatic transgression and masses located in the left hemithorax. Damage to the diaphragm may be essential for splenosis to present...
in the pleural space [20]. Moreover, the age of the patient must also be considered. While the 38-year-old male is a daily smoker, the median age of lung cancer diagnosis is 70 years old [21], making pleural malignancy a less likely diagnosis. Although we did not conduct nuclear imaging, Technetium-99m heat damaged erythrocyte study is considered the optimal imaging technique for splenosis [22], we are confident in our diagnosis because the pleural masses and the left upper quadrant masses are continuous across the diaphragmatic defect.

Patients presenting with splenosis, by definition, have experienced trauma to the spleen and or splenectomy. Since the primary purpose of the spleen is to filter aging erythrocytes and blood borne pathogens [23], asplenic patients are at increased risk for infections, particularly from Hemophilus influenza, Streptococcus pneumonia, and Neisseria meningitidis—all encapsulated bacteria that are typically eliminated by a functioning spleen [24]. Asplenic patients are also at heightened risk for developing sepsis [25]. While some reports indicate splenosis may provide immune function [26,27], a review of the literature by Connell et al suggests that such benefit, if it exists, is not protective against overwhelming infection like sepsis [10]. Our patient did not present with any history of infections or sepsis.

In terms of treatment, asymptomatic splenosis does not warrant surgical intervention [20]. However, we were unable to find any prospective studies evaluating the long-term outcomes of patients diagnosed with splenosis. Further investigation is necessary to better understand the sequela of splenosis.

Acknowledgments

Publication of this article was funded by the University of Idaho - Open Access Publishing Fund.

REFERENCES

[1] Ferrer Marrero TM, Prieto-Centurion V, Jaffe HA. Thoracic splenosis: history is the key. Respir Med Case Rep. 2017;22:251–3. doi: 10.1016/j.rmcrr.2017.09.006.

[2] Bajwa SA, Kasi A. Anatomy, Abdomen and Pelvis, Accessory Spleen. StatPearls Publishing, 2019; http://www.ncbi.nlm.nih.gov/pubmed/30085582 Accessed August 30, 2019.

[3] Livingston CD, Levine BA, Lecklitter ML, Sirinek KR. Incidence and function of residual splenic tissue following splenectomy for trauma in adults. Arch Surg 1983;118(5):617. doi: 10.1001/archsurg.1983.01390050083016.

[4] Fleming RC, Dickson RE, Harrison EG. Splenosis. The autotransplantation of splenic tissue. Am J Med 1976;61:414–19.

[5] Gaines JJ, Crosby JH, Vinayak Kamath M. Diagnosis of thoracic splenosis by tru-cut needle biopsy. Am Rev Respir Dis 1986;133(6):1199–201. doi: 10.1164/arrd.1986.133.6.1199.

[6] Fukuahara S, Tyagi S, Yun J, Karpeh M, Reyes A. Intrathoracic splenosis presenting as persistent chest pain. J Cardiothorac Surg 2012;7(1):7–9. doi: 10.1186/1749-8090-7-84.

[7] Gopal K, Jones MT, Greaves SM. An unusual cause of chest pain. Chest 2004;125(4):1536–8. doi: 10.1378/chest.125.4.1536.

[8] Cordier JF, Camondes JP, Marx P, Heinlen I, Loire R. Thoracic splenosis presenting with hemoptysis. Chest 1992;102(2):626–7. doi: 10.1378/chest.102.2.626.

[9] El-Kheir A, Abdelnour M, Boutros JG. Simultaneous small bowel and colon obstruction due to splenosis. A case report and review of literature. Int J Surg Case Rep. 2019;58:63–6. doi: 10.1016/j.jscr.2019.03.040.

[10] Connell NT, Brunner AM, Kerr CA, Schiffman FJ. Splenosis and sepsis: the born-again spleen provides poor protection. Virulence 2011;2(1):4–11. doi: 10.4161/viru.2.1.14611.

[11] Sánchez Aguilar M, Fernández López R, Tirado Hospital JL, Garcia Gómez FJ. Splenosis toracoabdominal. Med Clin (Bac) 2017;148(6):242. doi: 10.1016/j.medcli.2016.05.012.

[12] Cohen EA. Splenosis. AMA Arch Surg 1954;69(6):777. doi: 10.1001/archsurg.1954.027006019004.

[13] Tulinsky I, Ihnát P, Mitták M, Guiková P, Zonča P. Intrathoracic splenosis - lesson learned: a case report. J Cardiothorac Surg 2016;11(1):72. doi: 10.1186/s13019-016-0474-3.

[14] Dorra T, Meriam S, Norsaf B, Anis H, Ehsen BB. Peritoneal nodules after splenectomy: splenosis or carcinomatosis? Presse Med 2018;47(9):837–8. doi: 10.1016/j.lpm.2018.06.006.

[15] Li Y, Liang P, Gao JB. Splenosis misdiagnosed as liver tumor: a case report. Zhonghua Gan Zang Bing Za Zhi 2018;26(2):145–6. doi: 10.3760/cma.j.issn.1000-3418.2018.02.014.

[16] Hashem A, Elbaset MA, Zahrani MH, Osman Y. Simultaneous peritoneal and retroperitoneal splenosis mimics metastatic right adrenal mass. Int J Surg Case Rep 2018;49:30–3. doi: 10.1016/j.ijscr.2018.05.015.

[17] Mathurin J, Lallemant D. Splenosis simulating an abdominal lymphoma. Pediatr Radiol 1990;21(1):69–70. doi: 10.1007/bf02010821.

[18] Remtulla M, Drury NE, Kaushal NA, Trotter SE, Kalkat MS. Thoracic splenosis masquerading as advanced lung cancer. Thorax 2017;72(2):189–90. doi: 10.1136/thoraxjnl-2016-209086.

[19] Syed S, Zaharopoulos P. Thoracic splenosis diagnosed by fine-needle aspiration cytology: a case report. Diagn Cytopathol 2001;25(5):321–4. doi: 10.1002/dc.2165.

[20] Kim K, Choi HJ, Kim YM, Kwon WJ, Lee WC, Suh JH. Thoracic splenosis: a case report and the importance of clinical history. J Korean Med Sci 2010;25(2):299–303. doi: 10.3346/jkms.2010.25.2.299.

[21] Torre LA, Siegel RL, Jamal A. Lung cancer statistics. Adv Exp Med Biol 2016;893:1–19. doi: 10.1007/978-3-319-24223-1_1.

[22] Yammine JN, Yatim A, Barabari A. Radionuclide imaging in thoracic splenosis and a review of the literature. Clin Nucl Med 2003;28(2):121–3. doi: 10.1097/01.RLU.0000048681.29894.BA.

[23] Mebius RE, Kraal G. Structure and function of the spleen. Nat Rev Immunol 2005;5(8):606–16. doi: 10.1038/nri1669.

[24] Leone G, Pizzigallo E. Bacterial infections following splenectomy for malignant and nonmalignant hematologic diseases. Mediterr J Hematol Infect Dis 2015;7(1):e2015057. doi: 10.4084/MJHID.2015.057.

[25] Altamura M, Altamura M, Caradonna L, et al. Splenosis and sepsis: the role of the spleen in the immune-mediated bacterial clearance. Immunopharmacol Immunotoxicol 2001;23(2):153–61. doi: 10.1080/10445410110083856.

[26] Khripun AI, Alimov AN, Pryamikov AD, Alimov VA. Immunological aspects in spleen ruptures surgery due to closed abdominal trauma. Khirurgiya 2015(3):76. doi: 10.17116/hirurgia2015376-80.

[27] Hathaway JM, Harley RA, Self S, Schiffman G, Virella G. Immunological function in post-traumatic splenosis. Clin Immunol Immunopathol 1995;74(2):143–50. doi: 10.1006/cimm.1995.1021.