

Overwhelming Post-Splenectomy Bacteremia Due to Streptococcus bovis Group Organisms: Report of Three Cases and Review of the Literature

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This report is our original work, has not been previously published, and is not under consideration for publication by any other journal.

Contributions of Authors to Manuscript Preparation Statement

All authors participated in this research and in the preparation of the manuscript as described below:

- **Samuel McCollum, MD**: Researched references; wrote portions of the manuscript; abstracted cases.
- **Joseph Myers, MD**: Wrote portions of the manuscript and edited the manuscript.

Abstract

We report three cases of severe post-splenectomy infection due to members of the *Streptococcus bovis*/*Streptococcus equinus* group, formerly called the *Streptococcus bovis* group, and review the literature for other cases associated with this organism.

Keywords: Post-splenectomy infection; Bacteremia; *Streptococcus bovis* Group Organisms; Asplenia.

Introduction

There are approximately one million people residing in the United States with anatomic or functional asplenia. [1] Approximately 100,000 of these people have sickle cell disease, and an estimated 25,000 people/year undergo surgical splenectomy for traumatic injury or for a variety of benign or malignant hematologic diseases. [1,2] The most feared complication of asplenia is overwhelming post-splenectomy infection (OPSI). The risk for OPSI is higher during the first three years after splenectomy, and the overall calculated risk per asplenic patient per year is approximately 0.25%. [3,4] In published series, *Streptococcus pneumoniae* is the most commonly reported microorganism isolated from blood in OPSI. [5-7] Historically, other encapsulated bacteria such as *Haemophilus influenzae* and *Neisseria meningitidis* have been touted as significant pathogens, but recent studies have found these organisms only infrequently. [5-7] *Streptococcus bovis* Group organisms (SBGO) have been reported only rarely. We found one large series in which SBGO was responsible for 1 of 47 episodes of OPSI (no details given) [7] and four separate case reports giving patient details of SBGO in OPSI. [8-11] We report three patients with SBGO-associated OPSI and review these and the four cases noted above.

Materials and Methods

As part of two consecutive IRB-approved Quality Improvement Projects at Summa Health, Akron, Ohio, we reviewed all patients with *Streptococcus bovis* Group (SBG) bacteremia from 2006 to 2017 (12 years) and from 2018 to 2022 (5 years). In the 2006-2017 group, we identified two patients with SBGO-associated OPSI, and in the 2018-2022 group, we identified one patient with SBGO-associated OPSI. We then performed both Google Scholar® and PubMed® searches using a combination of all combinations of “overwhelming post-splenectomy infection” OR “OPSI” OR “post-splenectomy sepsis” OR “asplenic sepsis” AND one of the following: “*Streptococcus bovis*” OR “*Streptococcus bovis* group” OR “*Streptococcus gallolyticus*” OR “*Streptococcus equinus*” OR “*Streptococcus lutetiensis*” OR “*Streptococcus infantarius*” OR “*Streptococcus gallolyticus*.” All cases with detailed patient information were recorded. One patient found in this literature search was reported within a series for which no detailed patient data were available. [7]

Results

The Google Scholar® and PubMed® searches identified five previously reported cases of *Streptococcus bovis* group bacteremia in asplenic patients. Four of the five patient reports provided details of the patients’ illnesses and past history. One patient was reported in a

series of 47 patients with OPSI with no detailed patient information available for review. Table 1 summarizes the characteristics of the four case reports with detailed patient information together with our three cases reported below.

Case Reports

Patient No. 1. A 70-year-old man presented to the Emergency Department (ED) with altered mental status, headache, and abdominal pain that began one day prior to admission. His past medical history included aortic stenosis with known aortic regurgitation, diabetes mellitus, smoldering multiple myeloma (on carfilzomib and dexamethasone), and surgical splenectomy incidental to the surgical resection of a pancreatic pseudocyst 10 years previously. He had received the 13-valent conjugated pneumococcal vaccine, meningococcal ACY vaccine, and *Haemophilus influenzae* type b vaccine remotely at the time of splenectomy. In the ED, he developed fulminant sepsis with hypotension, lactic acidosis, acute kidney injury, and leukocytosis and required fluid, antimicrobial, and pressor resuscitation. *Streptococcus bovis* was isolated from 2 of 2 blood cultures drawn in the ED. Lumbar puncture revealed normal cerebrospinal fluid (CSF) with negative cultures. He was treated with parenteral ceftriaxone (8 days) and oral levofloxacin (6 days) and recovered completely.

Patient No. 2. A 65-year-old woman with a past medical history of hypertension, chronic obstructive pulmonary disease, deep venous thrombosis, and surgical splenectomy 4 years previously for a splenic artery aneurysm presented to the ED with foot swelling, fever to 104.0°F, rigors, chills, nausea, vomiting, and lightheadedness. In the ED, vital signs were: Temperature = 103.1°F; Pulse = 119 beats/min; Blood Pressure = 82/57 mmHg; Respirations = 20 breaths/min; Oxygen saturation = 89% on room air. She had leukocytosis with 14% bandemia, lactic acidosis, acute kidney injury, and persistent hypotension and was admitted to the intensive care unit where she received intravenous fluid resuscitation, intravenous vancomycin, and piperacillin/tazobactam as well as pressor resuscitation. *Streptococcus bovis* group was isolated from 2 of 2 blood cultures drawn at admission. She was treated with intravenous piperacillin/tazobactam for 24 hours, then parenteral ceftriaxone for 8 days, followed by oral linezolid for 6 days. No source for bacteremia was identified, and echocardiography was unremarkable. Her prior vaccination history is unknown. She remained well after completion of oral linezolid therapy.

Patient No. 3. A 78-year-old man with a past medical history of abnormal heart rhythm, permanent dual-chamber pacemaker placement, diabetes mellitus, and non-Hodgkin's lymphoma status post therapeutic splenectomy for the lymphoma four years previously presented to the ED via squad with unresponsiveness, hypotension, lactic acidosis, and acute kidney injury. The patient had received the 13-valent conjugated pneumococcal vaccine, types B and ACY meningococcal vaccines, and *Haemophilus influenzae* type b vaccine after splenectomy. *Streptococcus gallolyticus* subspecies *pasteurianus* was isolated from 2 of 2 admission blood cultures. The patient was treated with intravenous vancomycin and piperacillin/tazobactam, as well as parenteral fluids, pressors, and eventually intermittent hemodialysis. On day 3, antimicrobial therapy was changed to ceftriaxone for the duration of hospitalization, and the patient was discharged on cefazolin 2 gm intravenously every Tuesday and Thursday and 3 grams intravenously every Saturday after hemodialysis treatments to complete 6 weeks of therapy because of bacteremia in the presence of a permanent pacemaker. No source for the bacteremia was found, and a transesophageal echocardiogram was negative for valvular vegetations and pacemaker lead vegetations. The

patient recovered successfully after completion of cefazolin therapy, and no relapse occurred during one year of follow-up.

Discussion

The global incidence of splenectomy is approximately 6.4-7.1 per 100,000 people per year. [12] Splenic salvage therapy is now employed in most patients with traumatic splenic injury. [12] However, splenectomy for certain leukemias or lymphomas, polycythemia vera, myelofibrosis, primary splenic malignancy, splenic metastatic disease, hemolytic anemias, hereditary spherocytosis, thalassemia, splenic abscess, and immune thrombocytopenic purpura are still not uncommon. [12] Added to this is the large burden of functional splenectomy that occurs in sickle cell disease, thereby making medical encounters with anatomically or functionally asplenic patients not unusual. [1] Asplenia likely influences the risk of infection and severity of infection via a variety of mechanisms, including reductions in IgG, fibronectin, IgM, neutrophil migration, and phagocytic activity. Any one or all of these factors would help explain the increased propensity for infection in this patient population. [1, 13]

Over the last two decades, there have been numerous changes to the classification and nomenclature system of the previously designated *Streptococcus bovis* group of organisms. [14-16] They are commensal organisms of the gastrointestinal tract of humans and other mammalian species. The currently preferred nomenclature is *Streptococcus bovis*/*Streptococcus equinus* complex (SBSEC), which refers to the non-enterococcal group D *Streptococcus* spp. complex. [14-16] However, regardless of the nomenclature change, the association of various members of this group of organisms with colon and other gastrointestinal tract cancers, with non-malignant gastrointestinal tract anatomic abnormalities, and with infective endocarditis remains unchanged. [17]

Table 1 summarizes the available clinical data for the four patients reported in the literature, as well as that of our three patients. [8-11] There were four male and three female patients. The mean age at presentation was 65.6 years, and the mean time of presentation after splenectomy was 8.3 years. The reasons for splenectomy in these patients were primarily hematologic and included ITP (two patients), hairy cell leukemia (one patient), marginal zone lymphoma (one patient), chronic natural killer cell lymphocytosis (one patient), splenic artery aneurysm (one patient), and incidental resection of a large myelomatous spleen during pancreatic pseudocyst resection (one patient). One patient had definite infective endocarditis of the mitral valve, and one had probable device-related endocarditis of a permanent pacemaker. Interestingly, two patients presented with SBG meningitis. Six of the seven patients (86%) survived primary hospitalization. The one death was in a 70-year-old woman with chronic natural killer cell lymphocytosis who presented with disseminated intravascular coagulation and died within hours of admission to the hospital.

**Table 1. Review of Literature: Patients with Splenectomy and
Streptococcus bovis Group Overwhelming Postsplenectomy Infection**

Case No.	First Author	Year	Age	Gender	Time After Splenectomy	Reason for Splenectomy	Reported Illnesses	GI Tract Workup	Endocarditis Work-Up	Primary Antibiotic Therapy	Lived/ Died	Misc.
1	Cohen	1997	53	Male	5 months	ITP	HIV Disease	Colonoscopy negative	TTE negative	Intravenous Penicillin G x 2 wk.	Lived	Had SBG meningitis
2	Ben-Ami	1999	74	Male	No Data	Hairy Cell Leukemia	None	"negative workup"	"negative workup"	Intravenous Amoxicillin (duration unknown)	Lived	Had SBG meningitis
3	Bigorra	2015	70	Female	No Data	Chronic Natural Killer Cell Lymphocytosis	Chronic Natural Killer Cell Lymphocytosis	No Data	Mitral Valve Endocarditis	"Antibiotics"	Died (within hours)	DIC & Death
4	Wardle	2018	49	Female	23 years	ITP	None	Colonoscopy negative	TTE negative	Ceftriaxone x 4 wk.	Lived	Developed venous sinus thrombosis
5	This Series	2023	65	Female	4 years	Splenic Artery Aneurysm	Hypertension, Transient Ischemic Attack	No Data	TTE negative	Ceftriaxone x 1 wk.; Linezolid x 1 wk.	Lived	
6	This Series	2023	78	Male	4 years	Marginal Zone Lymphoma	Heart Block with Permanent Pacemaker	No Data	TTE negative but probable pacemaker-endocarditis	Ceftriaxone x 2 wk.; Cefazolin x 4 wk.	Lived	Permanent Pacemaker
7	This Series	2023	70	Male	10 years	Multiple myeloma with incidental splenectomy during pancreatic pseudocyst resection	Multiple Myeloma	No Data	No Data	Ceftriaxone x 1 wk.; Levofloxacin x 1 wk.	Lived	
Total	All	All	Mean = 65.6 yr.	4 Male/ 3 Female	Mean = 8.3 Yr.	6 with hematologic issues	As Noted	As Noted	1 with definite endocarditis; 1 with probable pacemaker endocarditis	As Noted	6 Lived/ 1 Died	2 with meningitis; 2 with endocarditis; 1 rapid death due to DIC

Abbreviations Used: ITP = Idiopathic thrombocytopenic purpura; HIV = Human Immunodeficiency Virus; TTE = Transthoracic echocardiogram; TEE = Transesophageal echocardiogram; SBG = *Streptococcus bovis* Group; DIC = Disseminated intravascular coagulation

Conclusion

The members of the *Streptococcus bovis*/*Streptococcus equinus* complex group, formerly the *Streptococcus bovis* group, should be added to the bacterial species associated with OPSI. [8-11] Although this appears to be a rare occurrence, the publication of this organism-syndrome association may allow others to recognize OPSI due to members of the *Streptococcus bovis*/*Streptococcus equinus* complex group and report such cases in the literature.

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