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ID CASES

Pyogenic Pericarditis and Cardiac Tamponade Due to *Streptococcus anginosus* in a Combat Theater

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Streptococcus anginosus group pericarditis is rare. A 24-year-old male soldier presented for care at a military clinic in Afghanistan with shock and cardiac tamponade requiring emergent pericardial drainage and aeromedical evacuation. We review the patient's case, the need for serial pericardial drainage, and the available literature on this disorder.

Keywords. cardiac tamponade; Operation Enduring Freedom; pericarditis; *Streptococcus anginosus*.

CASE REPORT

A 24-year-old male US soldier presented for care at a military clinic at Kandahar Airfield, Afghanistan, for evaluation of 2 days of left-sided neck pain, nausea, and rapidly progressive orthopnea over 2 hours. His pain had begun as a dull ache, constant in nature, and gradually worsened until the onset of the nausea and orthopnea on the day of presentation. He had no significant past medical or surgical history and took no routine medications. He was initially normotensive and afebrile but tachycardic (131 beats/minute) and tachypneic (36 breaths/minute). Laboratory studies obtained during initial evaluation revealed a leukocyte count of 28 000 cells/mm^3 (62% band forms). He was immediately referred to the regional trauma receiving hospital for further care.

Examination in the trauma bay revealed jugular venous distension to the angle of the jaw and muffled heart sounds. Computed tomography of the chest demonstrated a large pericardial effusion with partial diastolic collapse of the right ventricle seen on bedside cardiac ultrasonography consistent with tamponade physiology. No evidence of associated mediastinal abscess or other contiguous spread from a site external to the pericardium was observed on imaging. Intravenous ceftriaxone and vancomycin were administered, and the patient was taken to the operating room for an emergent pericardial drainage catheter placement under sonographic guidance, with the drainage of 400 mL of purulent fluid (Figure 1). His periprocedural course was complicated by ventricular tachycardia and hypoxemia.

After placement of a drainage catheter, he rapidly developed septic shock and the acute respiratory distress syndrome requiring vasopressor support with norepinephrine and endotracheal intubation. Analysis of the fluid demonstrated 110 000 neutrophils/mm^3, protein >300 mg/dL, and glucose <10 mg/dL along with numerous Gram-positive cocci in singles and pairs. He was evacuated the following day by critical care air transport to Bagram Airfield, near Kabul, for ongoing care.

At Bagram, he was noted to have a persistently elevated central venous pressure of 22–24 mmHg and reaccumulation of pericardial fluid with the development of loculations that limited ongoing drainage via the indwelling drain. He developed recurrent tamponade physiology, confirmed by transeophageal echocardiography (Figure 2), despite attempted drainage facilitation using intrapericardial tenecteplase (15 mg). A subxiphoid transesophageal echocardiographic-guided pericardial window and placement of an additional large-bore pericardial drain was performed, with significant improvement in his hemodynamics.

He was subsequently transported on the third day after initial presentation to Landstuhl Regional Medical Center, Germany, where cultures of his pericardial fluid demonstrated

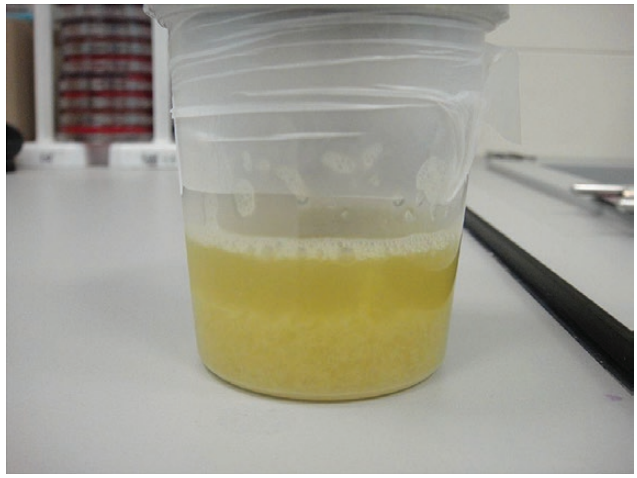

Figure 1. Sample of purulent pericardial fluid after emergent drainage.

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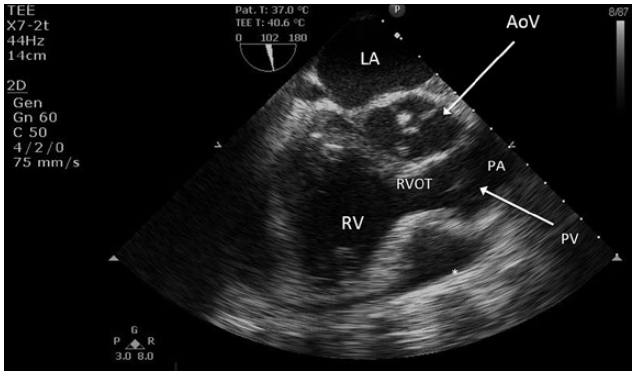

Figure 2. Transesophageal echocardiogram at Bagram Airfield, revealing a persistent loculated pericardial effusion (marked with an asterix) with diastolic collapse of the right ventricular outflow tract. AoV, aortic valve; LA, left atrium; PA, main pulmonary artery; PV, pulmonic valve; RV, right ventricle; RVOT, right ventricular outflow tract.

Streptococcus anginosus on conventional blood agar plates. Ceftriaxone was continued, and he was weaned from mechanical ventilation and transported back to the United States where a second pericardial window and large-bore pericardial drain were placed 9 days after his initial presentation. A total of 6 weeks of intravenous ceftriaxone was administered, with the remainder of his course complicated by atrial fibrillation that subsequently resolved. Six months later, he had returned to his baseline state of health and resumed normal activity.

DISCUSSION

Pyogenic pericarditis is a rare disorder that may lead to cardiac tamponade, hemodynamic collapse, and death. Before the advent of effective antibiotic therapy, pericarditis was a common complication of pneumonia due to *Streptococcus pneumoniae* as a result of direct extension from an adjacent pulmonary focus. Effective therapy requires prompt recognition, drainage of pericardial fluid, and bactericidal antibiotics.

Streptococcus anginosus and its related species, *Streptococcus intermedius* and *Streptococcus constellatus*, are normally commensals in the human oral, vaginal, and gastrointestinal tracts and collectively form the *S anginosus* group (SAG). They are facultative, nonmotile anaerobes with variable Lancefield group positivity and form small colonies that may be α-, β-, or nonhemolytic on conventional sheep's blood agar [1]. Using conventional microbiologic techniques, they may be distinguished from other streptococci through the Voges-Proskauer test for the production of acetoin and 2,3-butanediol, by the hydrolysis of arginine, and their inability to ferment sorbitol [2].

Virulence factors in SAG are not yet well characterized. Molecular mimicry with endothelial selectins present in the host's vasculature may play a role in the frequency of endovascular infections seen with SAG. Other putative virulence factors are similar to those identified in other streptococci. These include laminin-binding proteins (similar to those seen in *Streptococcus agalactiae*), polysaccharide capsule production (as with pneumococci), and occasional production of β-hemolysins (similar to streptolysin O in *S pyogenes* and the pneumolysin produced by pneumococci) [3].

The incidence of SAG infection varies by population and site of infection. The incidence of invasive SAG infection increases with age, with higher risks associated with alcohol abuse in some series [4], but disease has been described in all age groups. Overall, 40%–50% of invasive pyogenic streptococcal disease [5] may be associated with SAG. Among the 3 species, *S anginosus* has been more closely associated with endocarditis and other endovascular infections [6], as well as abscess formation as a coinfection with *Eikenella* and other oral anaerobes [7]. In an Israeli series, approximately 75% of SAG infections were community-acquired, with intra-abdominal abscess present in 71 of 202 (35%) and bacteremia in 19 of 202 (9.4%) [8].

Antimicrobial drug resistance is unusual, with most isolates being broadly susceptible to most β-lactams including penicillin. Reduced penicillin susceptibility has been described, similar to other viridans streptococci [9], along with emerging resistance to clindamycin and macrolides [10]. Fluoroquinolones appear active in vitro, but clinical data are currently lacking. Clinical failure has occured in a bacteremic patient with septic shock while receiving daptomycin, although the mechanism of resistance to daptomycin remains unclear [11].

Twenty prior cases of pericarditis due to SAG have been reported in the literature (Table 1) [12–29]. The relative incidence of SAG pericarditis is unknown. In one recent series from the United States, viridans streptococci were identified as the causative pathogens in 8 of 138 (6%) of cases of infectious pericarditis requiring drainage or pericardiectomy [30], potentially including SAG. Risk factors identified in prior cases have included esophageal carcinoma, preceding oral infections, and direct extension from adjacent pleural empyema and pneumonia. Like our patient, all prior cases presented in cardiac tamponade (when cited). Unlike most streptococci, *S anginosus* produces abscesses that may require repeated drainage; 6 of the 20 previously reported patients required pericardiectomy, whereas an additional 2 patients required intrapericardial thrombolytic therapy due to extensive loculations and adhesions despite percutaneous drainage. Mortality was low in the cases reported, with deaths reported only in patients with advanced malignancy.

This patient's care was complicated by his diagnosis in an active combat theater and the development of loculations requiring repeated drainage using catheters of larger diameter than are typical of nonpurulent tamponade. His survival was dependent on the ability of North Atlantic Treaty Organization (NATO) forces to provide robust forward-deployed critical care and surgical capabilities, both on the ground and in the air and including cardiac ultrasonography equipment. In 2012, the NATO Role 3

Table 1. Previously Reported Cases of Pericarditis Due to *Streptococcus anginosus* Group Organisms[a]

Age	Gender	Tamponade	IPT	Pericardiectomy	Outcome	Comorbid Conditions	Country
42	M	Y	N	Y	Survived	Pulmonary tuberculosis	Japan
55	M	Y	N	Y	Survived	Squamous cell carcinoma of the lung	Japan
16	F	NP	NP	Y	Survived	Direct extension to pericardium from descending mediastinitis after tonsillar abscess	Italy
69	F	Y	N	N	Survived	Diabetes mellitus	Japan
54	M	Y	Y	N	Survived	None stated	Spain
20	F	Y	N	Y	Survived	Postpartum	USA
71	F	Y	N	N	Survived	None stated	Belgium
63	M	Y	N	N	Expired	Metastatic melanoma, complication of TBNA	USA
47	M	Y	N	N	Expired	Esophageal carcinoma with esophagopericardial fistula	USA
40	F	NP	Y	N	Survived	Direct extension from pneumonia and mediastinitis	Poland
NP	NP	NP	N	NP	NP	Peritonitis due to biliary tract disease	Spain
NP	NP	NP	N	NP	NP	Preceding oral infection, pleural empyema	Spain
35	M	Y	N	N	Survived	Hepatic abscess with direct extension into pericardial and pleural spaces	Spain
54	M	Y	N	N	Expired	Esophageal carcinoma with esophagopericardial fistula	Japan
61	M	Y	N	N	Expired	Esophageal carcinoma with esophagopericardial fistula	Japan
14	M	Y	N	Y	Survived	Preceding oral infection; drainage complicated by myocardial laceration	China
56	F	Y	N	N	Expired	Esophageal carcinoma with esophagopericardial fistula	Japan
17	F	Y	N	Y	Survived	None stated	USA
62	M	Y	N	N	Expired	Esophageal carcinoma with esophagopericardial fistula	Spain
23 m	F	Y	N	Y	Survived	Pericardial teratoma	USA

Abbreviations: F, female; IPT, intrapericardial thrombolytics; M, male; N, no; NP, not provided in the published report; TBNA, transbronchial needle aspiration: Y, yes.

[a]Age is in years, unless followed by "m" (months).

Multi-National Medical Unit (Kandahar Airfield, Afghanistan) had a medical staff that included specialists in critical care medicine, infectious diseases, anesthesiology, and interventional radiology in addition to general, trauma, cardiothoracic, neurologic, and orthopedic surgeons. Similar capabilities existed at the Craig Joint Theater Hospital at Bagram Airfield, where cardiology consultation was also available. Critical care air transport teams were able to transport this patient and thousands of other critically ill and injured patients from Kandahar to Bagram and thereafter to Landstuhl, Germany and to hospitals in their home countries. Without these capabilities, this patient's excellent outcome could not have been assured.

CONCLUSIONS

Pyogenic pericarditis due to SAG organisms is a rare but rapidly life-threatening condition and may occur as a community-acquired infection in healthy hosts. Effective treatment requires expeditious drainage of pericardial fluid, effective antibacterial therapy, and comprehensive critical care support. Repeated drainage, intrapericardial thrombolytics, and pericardiectomy may be necessary to achieve cure given the loculated nature of SAG infections.

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