

Case Series

Group C and G Streptococcal Septic Shock in Two Pediatric Patients

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- Beta-hemolytic strep
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Abstract

Group C and G streptococci, classified as *Streptococcus dysgalactiae* subsp. *equisimilis* (SDSE), are an unusual cause of sepsis in pediatric patients. SDSE have a similar pathogenicity to *Streptococcus pyogenes*, and can cause pharyngitis and skin and soft-tissue infections. Rarely, these organisms cause invasive disease including osteoarticular infections, bacteremia, and meningitis. In this report, we present two pediatric patients who were diagnosed with sepsis secondary to infection with group C and G streptococcus. Both were treated with penicillin G and recovered from the infection.

ABBREVIATIONS

SDSE: *Streptococcus dysgalactiae* subsp. *equisimilis*; PICU: Pediatric Intensive Care Unit; CBC: Complete Blood Count; WBC: White Blood Count; GCS: Group C Streptococcus; GGS: Group G Streptococcus; HR: Heart Rate; RR: Respiratory Rate; BP: Blood Pressure; T: Temperature; CT: Computed Tomography; MRI: Magnetic Resonance Imaging

INTRODUCTION

Although group C and G streptococcus, jointly classified as *S. dysgalactiae* subsp. *equisimilis* (SDSE), is an uncommon cause of bacteremia and invasive disease in children, they can cause significant morbidity as demonstrated in the cases reported here. The pathogenicity of SDSE is similar to that of *Streptococcus pyogenes*, and most commonly manifests as cellulitis, bacteremia, and osteomyelitis [1]. SDSE has remained sensitive to penicillin G, which is the first-line treatment for these infections. Invasive infections due to SDSE have been described with increasing frequency in the adult population but remain uncommon in children.

CASE PRESENTATIONS**Case report 1**

A 2-year-old female with tuberous sclerosis and associated epilepsy, cardiac rhabdomyomas, and congenital lymphedema of her left leg all related to her underlying diagnosis presented to a community hospital in summer 2013 with a one day history

of right upper quadrant abdominal pain and left thigh pain. The left leg was described by her mother as appearing "tighter than usual". At that time, her temperature was 37.9°C and metabolic profile, complete blood count and differential were normal. She was referred to our hospital for further evaluation.

On initial exam in our emergency department, she was febrile (T 40°C), ill-appearing, and irritable. Other vital signs were HR 164 beats/min, RR 63 breaths/min, and BP 86/39 mm/Hg. Her abdomen was tender to palpation in the right upper quadrant without rebound or guarding. Her entire left leg was edematous. Both thighs were painful to palpation. Several healed shallow lacerations were present on the lower extremities. Hypopigmented patches were present on her face, trunk, and extremities.

She received aggressive fluid resuscitation and was admitted to the hospital's pediatric intensive care unit (PICU) for fluid-resistant septic shock. She was intubated and treated with epinephrine and dopamine infusions and broad-spectrum antibiotics. At the time of admission, her WBC count was 1.32 thousand/uL, with a differential of 23% neutrophils, 65% lymphocytes, and 10% monocytes, hemoglobin 10.8 g/dL and platelets 198,000/uL. Her serum bicarbonate was 9 mmol/L. An abdominal and pelvic contrasted computed tomography (CT) scan demonstrated findings consistent with cellulitis involving her abdominal wall, pelvis and upper thighs. A doppler ultrasound of the vessels of her pelvis and lower extremities was negative for thrombus. Blood culture obtained utilizing the Bactec Peds Plus culture bottle (Becton, Dickinson and Company, Franklin

Lakes, NJ) was positive with the organism identified as group C streptococcus. The organism was first grown on both blood and chocolate agar followed by sero-grouping and utilization of VITEK® MS, which is an automated microbial identification system that uses innovative mass spectrometry (BioMerieux, Inc. Durham, NC). By day 4 of hospitalization, she was weaned off of all vasoactive drugs. She was extubated on day 4 to oxygen per nasal cannula, and ultimately weaned to room air on hospital day 11. She was treated with penicillin for a total of 14 days for bacteremia and cellulitis. Fever was present for almost 2 weeks, but despite repeated imaging, including serial echocardiograms given her underlying cardiac rhabdomyomas, no additional focus of infection was found other than cellulitis.

Case report 2

A 6-year-old female, with past medical history significant for poor dentition and an atrial septal defect, presented in septic shock with a chief complaint of fever and hip pain in summer 2015. Two weeks prior to admission, she had a minor fall with subsequent complaint of left leg pain. Three days before admission she became febrile and began refusing to bear weight. On presentation, she was febrile to 38.5°C, with HR 144 beats/min, BP 102/58 mm/Hg, RR 28 breaths/min and oxygen saturation 96% on 2L O₂ by face mask. She was ill-appearing, irritable, and sleepy, with dry mucous membranes and pale conjunctivae. Her breathing was labored. Her left leg was flexed and externally rotated at the hip and movement produced pain. Her WBC count was 6.29 thousand/uL, with a differential of 71% neutrophils, 18% lymphocytes and 8% monocytes, hemoglobin 8.8 g/dL, and platelet count 191,000/uL. A magnetic resonance image (MRI) revealed a large left-sided hip effusion.

She was taken emergently to the operating room for drainage of septic hip and started on vancomycin. Post-operatively in the PICU, she required press or support and mechanical ventilation. Blood culture using the Bactec Peds Plus was obtained prior to initiation of antibiotics and joint fluid obtained intra-operatively was inoculated into a Bactec Peds Plus culture bottle (Becton, Dickinson and Company, Franklin Lakes, NJ). Both of these samples grew group G *Streptococcus dysgalactiae* (GGS). Identification confirmed by growth on blood and chocolate agar, sero-grouping and VITEK® MS (BioMerieux, Inc. Durham, NC). She was treated with penicillin for the remainder of her admission. Prior to hospital discharge, she required repeat drainage of her hip. As an outpatient, a subsequent MRI revealed she had developed osteonecrosis of the femoral head and chronic osteomyelitis. Due to these complications, she received an extended course of penicillin for a total treatment course of eight months.

DISCUSSION

We describe two children who presented in septic shock secondary to group C and group G streptococci, which are both unusual causes of sepsis in young children. Most group C and group G pathogenic bacteria in humans are grouped together as *Streptococcus dysgalactiae* subsp. *Equisimilis* (SDSE). They are similar clinically and in their pathogenicity to *Streptococcus pyogenes*. They are beta hemolytic on solid agar and both can colonize the pharynx and may cause pharyngitis [2]. Because they can colonize without causing disease, the frequency of

pharyngitis by these streptococci is not known. They also colonize the skin, vagina, and gastrointestinal tract [3]. SDSE have been reported to cause skin and soft-tissue infections, pneumonia, and invasive disease such as necrotizing fasciitis, endocarditis, osteoarticular infections, meningitis, and streptococcal toxic shock syndrome [4]. One study of invasive non-group A and B beta-hemolytic streptococcus infections reported cellulitis to be the most common disease associated with SDSE (41%), and bacteremia without a focus (26%) and osteomyelitis (9%) were less common [5].

Although infections due to these organisms are increasing in incidence in the elderly and are associated with significant morbidity and mortality, they remain very uncommon in children, especially those younger than 12 years [6]. Of the 212 patients identified with SDSE infection in a population-based study, only 3 were under age 20 [5]. A retrospective review to identify all cases of group C and G streptococcal infections at a children's hospital Buffalo, NY over a 10 year period from 1995 to 2004 identified only 9 cases of group C and G streptococcal infections, all of which were in patients between 12-18 years old [7]. The highest published incidence of SDSE in children comes from a study done in 1991 which summarized all cases of group C streptococcal infection reported in the literature; this retrospective analysis found that 17 of 88 published cases of GCS infection (19.3%) were in patients younger than 18 years of age, but did not further specify exact ages of these pediatric patients [3].

Risk factors for infection with these streptococci in children have not been identified. In adults, risk factors include diabetes mellitus, cardiovascular disease, malignancy, and chronic skin conditions such as venous stasis and lymphedema. Fewer than 25% of children with SDSE infections have had one of these risk factors reported [4]. Only one of the children reported here had potential risk factors for invasive SDSE infection. The first patient had chronic lymphedema, a rare association with her underlying tuberous sclerosis that likely predisposed her to developing cellulitis and subsequent bacteremia. The second patient had no identifiable risk factors, and although on physical exam she had significant dental caries, these have not been identified as a risk factor for SDSE infection.

First-line treatment for *S. dysgalactiae* subsp. *equisimilis* infection is penicillin G. These organisms have remained almost universally sensitive to penicillin. For patients with allergies to penicillin, cephalosporins, vancomycin and clindamycin have all been used. Several studies have suggested that gentamicin should be added for bactericidal synergy in patients with life-threatening infections such as endocarditis [2].

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