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Report of 2 Fatal Cases of Adult Necrotizing Fasciitis and Toxic Shock Syndrome Caused by *Streptococcus agalactiae*

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We describe 2 cases of fatal necrotizing fasciitis and toxic shock syndrome caused by *Streptococcus agalactiae*—a rare entity that has been reported in only 9 patients—in 2 nonpregnant adults.

Necrotizing fasciitis is a severe soft-tissue infection associated with rapidly progressive necrosis of the subcutaneous tissue and superficial fascia [1]. The disease is also characterized by early development of systemic toxicity [2]. The dreadful disease is usually caused by invasive *Streptococcus*, of which *Streptococcus pyogenes* is the most often encountered species [3–5]. Delay in diagnosing necrotizing fasciitis is common because differentiating the evolving necrotizing fasciitis from cellulitis can be very difficult [6]. Treatments include rapid radical debridement and administration of appropriate antibiotics. However, even with proper treatment, the mortality rate remains as high as 53% [3].

We describe 2 adults with fatal necrotizing fasciitis associated with toxic shock–like syndrome due to *Streptococcus agalactiae*. Only 9 similar cases have been reported previously.

Case Reports

Case 1. A 75-year-old hypertensive woman was referred to our teaching hospital by her family physician because of shock and left-leg swelling; the overlying skin had a dusky appearance. Severe left-leg pain had begun 2 days prior to admission. The diagnosis on the referral letter was “deep-vein thrombosis.”

She was in a comatose state on admission. Her blood pressure was 95/55 mm Hg, and her pulse rate was 120 beats/min. The skin of her left leg was inflamed up to the knee, with some patchy areas having a dusky appearance. The dorsum of her left foot was grossly swollen. The second and third toes of her left foot had pressure sores at the tips, with claw-toe deformities that were probably due to peripheral vascular disease secondary to her long-term, poorly controlled hypertension. We believed that the ulcers were the entry sites of the bacteria. Although

there was no effusion on the left knee, there was a positive patellar tap in the opposite knee. Subcutaneous aspiration of the left-leg lesion and intra-articular aspiration of the right knee were performed, and gram-positive organisms were present in the specimens from both sites. Penicillin G and clindamycin were given intravenously. The gram-positive organisms were later confirmed to be a pure growth of *S. agalactiae* that is susceptible to penicillin G and clindamycin.

The initial blood investigation revealed leukopenia, with a WBC count of 2.9 cells/mm³; anemia, with a hemoglobin level of 11.5 g/dL; and thrombocytopenia, with a platelet count of 67 × 10⁹ cells/L. The prothrombin time (14.4 s), activated partial thromboplastin time (45.9 s), and international normalized ratio (1.4) were all prolonged. The fibrinogen level was 6.32 g/L. Her random blood glucose level was 9.5 mmol/L. Other levels were as follows: urea, 24.0 mmol/L; creatinine, 372 μmol/L; and spot glucose, 5.1 mmol/L.

Four hours after admission, an emergency above-knee amputation of her left lower limb was performed, and an open arthrotomy was done on her right knee to ensure thorough irrigation of the joint. Intraoperative findings, including loss of resistance of the subcutaneous planes, fat and fascia necrosis, and edema of the fascial layer, were typical of that of necrotizing fasciitis. The diagnosis was finally confirmed by histologic examination of the surgical specimens.

She was treated in the intensive care unit after surgery, with ventilator and inotropic supports. She died of disseminated intravascular coagulopathy 48 hours after surgery.

Case 2. A 64-year-old man with a known history of liver cirrhosis was admitted to our service because of right-calf swelling of 1 day’s duration. He had no history of injury to the affected limb. He was at the end stage of liver cirrhosis with ascites and had had previous episodes of bleeding esophageal varices.

His blood pressure on admission was 90/60 mm Hg, and his oral temperature was 40°C. His right calf was tender. The skin was dusky up to the knee, with bullae formation (figure 1). He had pancytopenia with a leukocyte count of 1.4 × 10⁹ cells/L, a hemoglobin level of 10.5 g/dL, and a platelet count of 60 × 10⁹ cells/L. Prothrombin time was 29.6 s, and activated partial thromboplastin time was 110.0 s. Other laboratory val-

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Figure 1. The right calf of a 64-year-old man, showing signs typical of necrotizing fasciitis: dusky skin and hemorrhagic bullae.

ues were as follows: spot glucose, 17.6 mmol/L; creatinine, 216 μ mol/L; urea, 18.4 mmol/L; and total bilirubin, 59 μ mol/L.

We obtained a pure growth of *S. agalactiae* from the 2 consecutive sets of blood cultures done prior to the commencement of antibiotic treatment. The organism was susceptible to penicillin G and clindamycin; iv cefuroxime was given empirically, but this was switched to iv penicillin G and clindamycin after we obtained the blood-culture results.

An above-knee amputation of his right lower limb was performed 4 h after admission. The intraoperative findings were typical of necrotizing fasciitis, including loss of tissue-plane resistance and necrosis of the subcutaneous fat. He was trans-

ferred to the intensive care unit after surgery because of respiratory and renal failure, disseminated intravascular coagulation, and persistent septic shock. He required dopamine and adrenaline to maintain a systolic blood pressure >100 mm Hg. He died 6 days after the operation.

Histologic examination of the amputated specimens confirmed the diagnosis of necrotizing fasciitis. However, bacteriologic studies of the amputated specimens and the peritoneal fluid were negative.

Discussion

The ability of *S. agalactiae* to cause invasive infections in adults is well documented [7–10]. Nevertheless, necrotizing fasciitis caused by *S. agalactiae*, which is probably the most severe and fatal form of invasive streptococcal infection, has been only rarely described in the literature. To the best of our knowledge, only 9 cases have been previously reported in the English-language literature [11–16]; these involved 3 neonates, 1 boy (10 years old), and 5 adults (table 1). *S. agalactiae* caused necrotizing fasciitis in 3 children born prematurely [11, 13] and 1 otherwise healthy child after operative treatment for a fracture [16]. Among reported adult infections, Sutton et al. [15] described a case of necrotizing fasciitis that complicated an episiotomy, and Riefler et al. [14] described another, involving a woman with diabetes mellitus. Both patients survived the infections despite significant morbidity. The first fatal case of necrotizing fasciitis due to *S. agalactiae* was reported by Gardam et al. [12], which involved a 67-year-old patient with chronic leukemia who developed necrotizing fasciitis and toxic shock syndrome. All the cases documented until now occurred in continental North America.

The significance of the concurrent septic arthritis in case 1 is 2-fold: it further demonstrated the invasiveness of the organism, and, more important, it illustrated the presence of multiple septic foci in necrotizing fasciitis. Although septic arthritis is a well-documented complication of bacteremia, its presence together with necrotizing fasciitis is underreported [17]. In our case 1, the effusion of the septic arthritis could have easily been masked by the alarming signs and symptoms of necrotizing fasciitis. Therefore, in managing a life-threatening infection such as necrotizing fasciitis, a clinician should maintain a high index of suspicion of multiple septic foci.

Toxic shock syndrome is a rapidly deteriorating clinical situation including shock, multiorgan failure, and destructive soft-tissue infection. While it is well-known that group A streptococci induce this systemic problem, group B streptococci have only recently been described as a cause. Only 2 cases of *S. agalactiae*-related toxic shock-like syndrome have been previously reported in the English-language literature; these involved a 27-year-old woman with streptococcal toxic shock syndrome caused by *S. agalactiae* that was probably due to vaginal colonization [18], and a 67-year-old woman with chronic leukemia with coexisting necrotizing fasciitis [12].

Table 1. Summary of documented cases of necrotizing fasciitis caused by group B streptococci.

Reference	Patient's age/sex	Underlying disease and/or predisposing condition	Site(s) affected	Antibiotic(s) given	Outcome
[13]	7 w/M	Premature birth at 28 w	Right thigh	Penicillin	Survival with debridement
[13]	11 w/M	Premature birth at 32 w	Scalp, meninges (meningitis)	Penicillin, gentamicin	Survival with debridement
[11]	5 w/F	1150-g Firstborn twin	Right mandible	Methicillin, gentamicin	Survival with debridement
[16]	10 y/M	Supracondylar fracture of right humerus; open reduction and internal fixation done	Distal third of the right arm, postoperative day 2	Penicillin G	Survival with debridement
[14]	51 y/F	Diabetes mellitus, left femoropopliteal bypass done	Left calf and leg, 1 mo postoperative	Penicillin G	Survival after above-knee amputation
[15]	26 y/F	Episiotomy for a spontaneous delivery	Lower abdominal wall, perineum, and buttock on postoperative day 4	Penicillin, clindamycin, tobramycin	Survival with extensive debridement
[12]	67 y/F	Chronic lymphocytic leukemia	Both legs	Penicillin G, clindamycin, ceftriaxone, ampicillin	Death, despite above-knee amputation of left leg
[12]	51 y/M	Diabetes mellitus, alcohol abuse	Scrotum	Ciprofloxacin, cephazolin, gentamicin, metronidazole, penicillin G	Survival with extensive debridement
[12]	34 y/M	Diabetes mellitus	Right calf	Ciprofloxacin, penicillin G, clindamycin	Survival with extensive debridement
PR	75 y/F	Hypertension	Left leg (and right-knee septic arthritis)	Penicillin G, clindamycin	Death, despite above-knee amputation of left leg
PR	64 y/M	End-stage liver cirrhosis, diabetes mellitus	Right calf	Penicillin G, clindamycin	Death, despite above-knee amputation of right leg

NOTE. F, female; M, male; PR, present report.

The 2 cases described in the present report fulfilled the definitions of streptococcal toxic shock syndrome introduced by the Working Group on Severe Streptococcal Infections [2]. Therefore, all 3 patients who did not survive were >60 years old, and all had both necrotizing fasciitis and toxic shock-like syndrome concomitantly. It is not clear why some patients with invasive *S. agalactiae* infection develop streptococcal septic shock-like syndrome and others develop necrotizing fasciitis or both. Although McGeer et al. [19] have recently shown that the risk factors for developing group A streptococcal toxic shock-like syndrome included patient age and toxin A genotype, an M-protein serotype and the presence of diabetes mellitus favor the development of necrotizing fasciitis. Such associations are not clear in *S. agalactiae* infections, however.

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