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Beta-Hemolytic Streptococcal Erythroderma Syndrome: A Clinical and Pathogenic Analysis

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Abstract

The syndrome of erythroderma due to beta-hemolytic streptococci is rarely seen and should be distinguished from cellulitis and toxic shock-like syndrome. We describe a novel syndrome of non-group A, beta-hemolytic streptococcal infection truncal erythroderma. The characteristics of this syndrome suggest that local factors were likely operative in the cutaneous manifestations of an exotoxin-associated erythroderma.

Keywords

Erythroderma; streptococcal; beta-hemolytic

INTRODUCTION

Erythroderma associated with bacterial infection usually presents as a localized cellulitis; rarely, a more generalized involvement can occur. Exotoxin production is thought to be operative in both localized and more generalized presentations and has been closely associated with beta-hemolytic, group A streptococcal infection^{1,2}, although but non-group A, beta-hemolytic streptococcal infection has also been linked to these presentations³. Non-group A, beta-hemolytic streptococcal infections have been associated with underlying venous and lymphatic compromise⁴ which can complicate radical hysterectomy, malignancies, nodal resection, irradiation therapy, and the lower extremities of patients who have undergone coronary artery bypass grafting with saphenous venectomy.

We describe a patient who developed an extremely unusual truncal erythroderma syndrome who had prior mastectomy and irradiation and distinguish the presentation from cellulitis and toxic shock-like syndrome.

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Case Report

A 56-year-old woman with a 6-day history of body aches and 4-day history of fever, headaches, nausea, anorexia, chills, and lower abdominal tenderness was admitted to the hospital with an erythematous skin eruption. The eruption was first noticed the previous night on her lower back and buttocks. By the time she presented to clinic the following day, it had spread to include most of her back and chest. The remainder of her review of systems was negative including no sore throat, burning with urination, or vaginal discharge. Prior to symptom onset, she had been in her usual state of health. In the weeks prior to presentation she had been at a cabin in Wisconsin where she had been immersed in river water up to her waist, but denied a history of animal exposure or tick bites. She denied having sick contacts. She had not had any recent medication changes and had been in a stable, monogamous relationship with her husband. Her past medical history included high-risk stage IIIA left breast carcinoma diagnosed in 2004, status-post left mastectomy in 2004 and right prophylactic mastectomy in 2005 with subsequent radiation to the left chest wall, osteopenia diagnosed in 2007, De Quervain's tenosynovitis, and rosacea. She had group B streptococcal vaginal colonization in the past.

On hospital admission, her oral temperature was 39.3 C, pulse was 88 beats per minute and regular, respiratory rate of 20 breaths per minute, and blood pressure was 102/63 mm Hg. No murmur was heard on cardiac examination. Although the lower abdomen was tender to palpation, bowel sounds were present and active. The skin eruption was sharply demarcated macular, erythematous, blanching and confluent on the back and front of her torso. Her face, neck and all four extremities were spared (Figure 1). The erythroderma was warm to the touch with a small area of desquamation in the middle of the lower back. The eruption was tender, with pain rated at 5/10, but not pruritic. She described the erythroderma as feeling like "a bad sunburn." The remainder of her examination was normal. Blood cultures were obtained and intravenous ceftriaxone was initiated.

During the first two days of her hospitalization, an electrocardiogram was done and was normal, the myalgias improved, and her vital signs remained stable. The fever, abdominal pain, and anorexia persisted, and the erythroderma showed minor extension beyond the marked borders, accompanied by the development of leukocytosis. The erythema was more intense in the area of the prior irradiation at the left breast mastectomy site. Due to the concern for erythroderma syndrome in the setting of likely venous and lymphatic compromise, ceftriaxone was discontinued and intravenous cefazolin was administered for coverage of beta-hemolytic streptococci.

Blood cultures and surveillance cultures of the nares, oropharynx, vagina, rectum, toe webs, and lower back lesion were obtained. All cultures were negative, except for a throat culture, which grew beta-hemolytic, non-group A, non-typeable streptococcus. Other cultures and serological markers were negative, including Lyme serologies and HSV cultures. An elevated antistreptolysin O (ASO) test confirmed a recent streptococcal infection.

The patient's vital signs remained stable throughout her hospitalization and her symptoms gradually improved on antibiotic therapy with eventual resolution of the fever, erythroderma, abdominal pain, and leukocytosis. At the time of ambulatory care follow-up the prior involved area of erythroderma was desquamating. Serial ASO titers rose more than five-fold following discharge. Convalescent serum samples were screened for antibodies to streptococcal exotoxins and the results were negative for streptococcal pyrogenic exotoxins A, B, and C.

Discussion

The systemic symptoms and cutaneous findings in this patient had some resemblance of toxic shock-like syndrome, but the truncal distribution of the erythroderma was distinctly unusual for both toxic shock-like syndrome and cellulitis.

It is well established that the superantigens streptococcal pyrogenic exotoxins (SPEs) are associated with the systemic symptoms of streptococcal toxic shock-like syndrome.² DNA coding for many of the SPEs are contained on mobile bacteriophage elements⁵ that have mobility not only within species across M serotypes, but also across species⁶. Horizontal transfer from Group A streptococcal species into Group C streptococcus equisimilis has been documented in vitro, reflecting a mobility which likely extends to other species of streptococcus, by extension suggesting that toxigenic conversion can occur between species. Clinically, streptococcal toxic shock-like syndrome (STSS) has been reported in non-group A beta-hemolytic streptococcal infections including cases due to group G streptococcus, group C streptococcus, and group B streptococcus, with evidence of SPE activity^{3,7}. Our hypothesis of exotoxin activity in the current case description due to a non-typeable beta-hemolytic streptococcal infection is novel, but not surprising.

There is a wide range of clinical presentations among patients who are colonized or infected with exotoxin-producing strains of beta-hemolytic group A streptococcus, and this variation has been attributed to differences in the levels of toxin-neutralizing antibodies⁸. Patients who produce sufficient toxin-neutralizing antibodies are spared the systemic symptoms associated with exotoxin exposure, whereas patients who are deficient in exotoxin-neutralizing antibodies experience STSS. Unlike STSS, our patient's desquamating erythroderma was less diffuse and was associated with, though did not begin with and was not limited to, an area that had previously been irradiated. Additionally, our patient did not experience renal impairment, coagulopathy, liver involvement, or adult respiratory distress syndrome, and her vital signs remained stable throughout her hospitalization.

The pathogenesis of superantigen involvement in disease production has been a topic of intense investigation for many years^{9,10}. It is well established that SPEs function as superantigens, facilitating a generalized activation of T cells, resulting in the widespread release of inflammatory factors¹¹. The mechanisms involved in vivo are yet to be fully identified. In the current case description, the patient had evidence of a recent streptococcal infection based on the presence of an elevated ASO, a positive throat culture of non-typeable beta-hemolytic streptococcus, and a clinical presentation that characterized many of the known systemic effects of exotoxins. The cutaneous findings, however, were not diffuse. This observation may be important in that it could suggest that the effects of exotoxin, which classically causes diffuse erythroderma, may reflect a local mechanism of T-cell activation. This observation is not without precedent as previous work has demonstrated that bacteriophage induction can be mediated by a local soluble factor produced by host cells¹². The involvement of skin that has been irradiated (damaged) suggests that there is a loss of or lack of some mediator that leads to desquamating erythroderma, a hypothesis that has been previously proposed⁷. Alternatively, it is possible that non-typeable, beta-hemolytic streptococcal infections involve unique pathogenic mechanisms that have yet to be defined.

Subsequent study will increase our understanding of exotoxin-mediated syndromes. The current case report provides a unique view of toxin-mediated illness and its varied presentations. Clinicians should appreciate the range of presentations and the need for diagnostic and therapeutic interventions that are directed toward a beta-hemolytic streptococcal etiology.

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Figure 1.

Erythroderma in an acute phase of illness. (A) Anterior chest and abdomen. (B) Posterior chest with area of desquamation on lower back. (C) Left lateral chest and uninvolved arm.