



SHOCKINGLY DEADLY! STREPTOCOCCAL TOXIC SHOCK SYNDROME

Amanda Hersh, D.O., Chris Stacy, M.D., Keith Norton, M.D.

Department of Pathology and Anatomical Sciences, University of Missouri
Office of the Chief Medical Examiner of Boone/Callaway, Columbia, MO 65212, USA



INTRODUCTION

We present the case of a 98-year-old woman with a medical history significant for severe dementia, hypertension, hypothyroidism, and stasis dermatitis secondary to severe peripheral vascular disease who was found in an altered mental state at a nursing home. Earlier that morning, she had been in her normal state of health. The staff notes that she now has increasing shortness of breath, a fever of 101.4 F, and difficulty maintaining oxygen saturations above 90%. A chest x-ray revealed perihilar and interstitial infiltrates with probable bilateral pleural effusions. Upon arrival of emergency medical services, she became unresponsive.

HOSPITAL COURSE

Assessment by the emergency department revealed a Glasgow coma score of 3. Her blood pressure rapidly declined to 59/20 mmHg and she was placed on Levophed.

Red Blood Cells	3.61 x 10(12)/L (3.9-5.03 x 10(12)/L)
White Blood Cells	1.48 x 10(9)/L (3.5 x 10.5 10(12)/L)
Creatinine	2.18 mg/dL (0.5-1.0 mg/dL)
Blood Urea Nitrogen	33 mg/dL (8-23 mg/dL)
Prothrombin Time	26.2 seconds (12.4-14.6 mg/dL)
Partial Thromboplastin Time	54.1 (26-34.7 seconds)
Prothrombin Time	26.2 seconds (12.4-14.6 seconds)
INR	2.3 (0.9-1.1)
Albumin	1.4 g/dL (3.5-5.2 g/dL)
Lactic Acid	7.1 mmol/L (0.5-2.2 mmol/L)

Blood cultures were drawn, she was administered antibiotics, but she expired within 3 hours of presentation. Within 24 hours, the blood cultures were positive for Group A β -hemolytic *Streptococcus* (*Streptococcus pyogenes*, GAS).

AUTOPSY FINDINGS

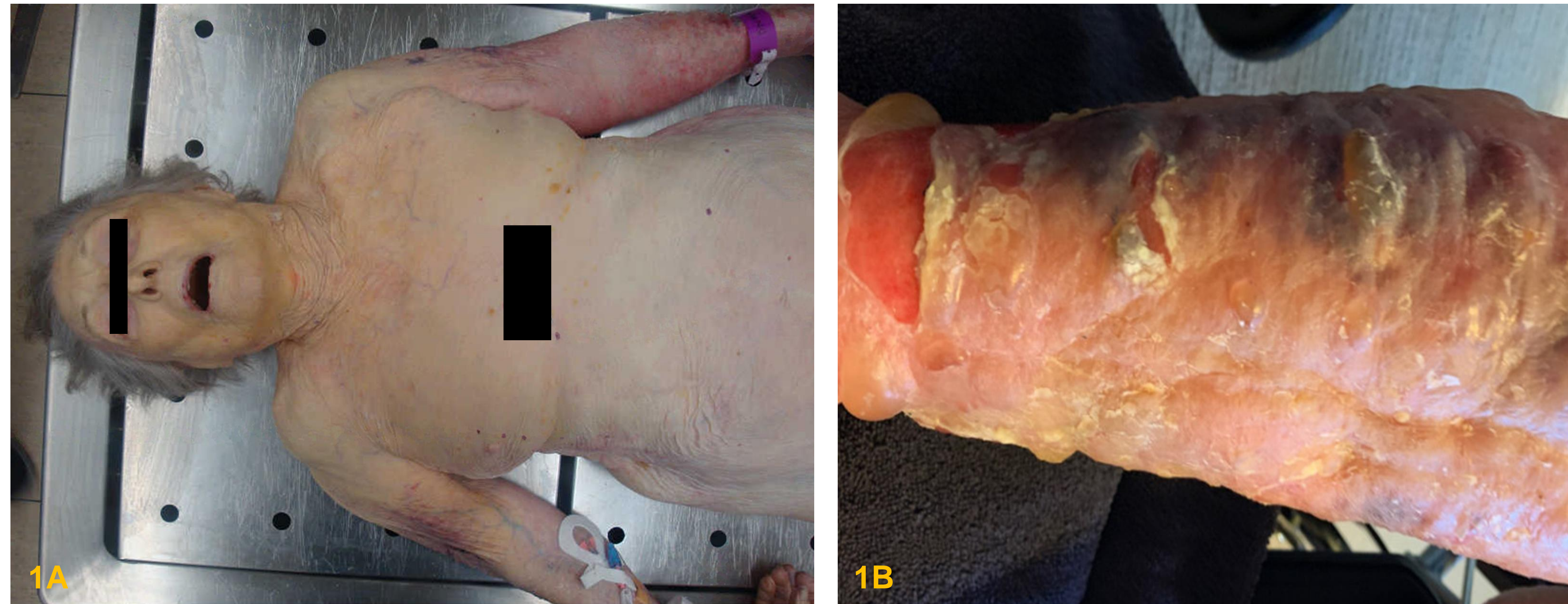


Figure 1A illustrates the swelling and erythema of the left upper extremity. At the time of autopsy, it was twice the circumference of the right upper extremity and had a desquamating rash. Figure 1B illustrates the severe stasis dermatitis of the lower extremities with chronic, poor-healing wounds and serous bullae formation.

Cardiovascular System	<ul style="list-style-type: none"> Aorta: Moderate-to-severe calcific atherosclerosis at the distal aorta extending into the bifurcation Coronary arteries: Mild atherosclerosis of all coronary arteries (<40%) Cardiomegaly (420 gm)
Respiratory System	<ul style="list-style-type: none"> Bilateral pleural effusions (Right 200 mL, Left 100 mL) Mild pulmonary edema (Right 520 gm, Left 530 gm) Diffuse perimortem blood clots within calcified vessel walls
Genitourinary System	<ul style="list-style-type: none"> Kidneys: Arteriolonephrosclerosis, disseminated petechial cortical hemorrhages, atrophic renal parenchyma Bladder: Thickened, trabeculated wall with focally erythematous mucosa
Hepatobiliary System	<ul style="list-style-type: none"> Congestive hepatopathy (nutmeg liver) Gallbladder distension with biliary sludge
Lower Extremities	<ul style="list-style-type: none"> Severe stasis dermatitis with multiple intact and ruptured serous bullae Bilateral pitting edema (2+, right greater than left) Increased calf circumference (Right 32.2 cm, Left 30.6 cm)
Upper Extremities	<ul style="list-style-type: none"> Left upper extremity: Subcutaneous edema with erythema from fingertips to middle portion of upper arm, serous bullae, ecchymosis of upper lateral arm Right upper extremity: Healing abrasion of upper lateral arm, ecchymosis of extensor surface of posterior lower arm

CAUSE OF DEATH

In our opinion, the cause of death is Streptococcal Toxic Shock Syndrome with contributing factors of moderate-to-severe atherosclerosis of the distal abdominal aorta leading to peripheral vascular disease, severe stasis dermatitis, and chronic, poorly healing wounds.

DIAGNOSIS OF STREPTOCOCCAL TOXIC SHOCK SYNDROME

An illness with the following clinical manifestations:

- Hypotension (Systolic blood pressure \leq 90 mmHg)
- Multiorgan involvement characterized by two or more of the following:
 - Renal impairment: Creatinine \geq 2 mg/dL or twice the upper limit of normal for age. * If preexisting renal disease, greater than twofold elevation over the baseline.
 - Coagulopathy: Platelets \leq 100,000 mm³ or disseminated intravascular coagulation (prolonged clotting times, low fibrinogen level, and fibrin degradation products).
 - Liver involvement: ALT, AST, or total bilirubin levels \geq twice the upper limit of normal for patient's age. * If preexisting liver disease, greater than twofold elevation over the baseline.
 - Acute respiratory distress syndrome: diffuse pulmonary infiltrates and hypoxemia in absence of cardiac failure OR diffuse capillary leak with generalized edema, pleural effusions with hypoalbuminemia.
 - Generalized erythematous macular rash that may desquamate.
 - Soft-tissue necrosis, including necrotizing fasciitis or myositis, or gangrene

Probable diagnosis: Case meets above clinical criteria with isolation of GAS from a nonsterile site (throat, vagina, skin lesion).

Confirmed diagnosis: Case meets above clinical criteria with isolation of GAS from sterile site (blood, CSF, joint fluid, etc.)

DISCUSSION

According to the World Health Organization, approximately 18.1 million people currently suffer from serious Group A Streptococcal (GAS) disease, another 1.78 million new cases occur each year, and these diseases are responsible for over 500,000 deaths each year. Streptococcal Toxic Shock syndrome (STSS) was first identified in the late 1980s. It is a severe illness that is associated with Group A Streptococcus (*Streptococcus pyogenes*) and is typically associated with an infection of cutaneous lesions. Individuals with STSS have signs of toxicity with a rapidly progressive clinical course. The Center for Disease Control estimates a fatality rate that likely exceeds 50%, even with aggressive clinical management. Per "Up-to-date," it is estimated that the prevalence rates in the elderly population are 9.3 cases per 100,000 people. STSS is a Category III reportable disease that must be reported to the local public health agencies within three days of diagnosis or suspicion.

References: Carapetis JR, Steer AC, Mulholland EK, Weber M. The global burden of group A streptococcal diseases. *Lancet Infect Dis*. 2005;5(11):685-94. Centers for Disease Control and Prevention. Streptococcus Disease, Invasive, Group A (GAS) (Streptococcus pyogenes) 1995 Case Definition. <https://ndc.services.cdc.gov/conditions/streptococcus-disease-invasive-group-a/> (Accessed on September 17, 2018) Stevens, D. L., MD, PhD (2020, May 12). Invasive group A streptococcal infection and toxic shock syndrome. Epidemiology, clinical manifestations, and diagnosis. Retrieved December 09, 2020, from <https://www.uptodate.com/contents/invasive-group-a-streptococcal-infection-and-toxic-shock-syndrome-epidemiology-clinical-manifestations-and-diagnosis?search=streptococcal+toxic+shock+syndrome>. Sims Sanyahumbi A, Colquhoun S, Wyber R, et al. Global Disease Burden of Group A Streptococcus. 2016 Feb 10. In: Ferretti JJ, Stevens DL, Fischetti VA, editors. Streptococcus pyogenes : Basic Biology to Clinical Manifestations [Internet]. Oklahoma City (OK): University of Oklahoma Health Sciences Center; 2016-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK333415/>