A 28-year-old woman is brought into the emergency room with a blood pressure of 60/40. The patient’s husband states that she had 2 days of nausea and vomiting, fever to 102°F, and myalgias. On examination, the patient appears lethargic and has mental confusion. Her skin has a sunburn-like rash diffusely. Auscultation of her heart reveals tachycardia. The lung examination demonstrates slight crackles at the lung bases. The abdomen is slightly tender throughout without any discernible masses. The uterus is nontender and the adnexa are normal to palpation. The laboratory evaluation reveals a hemoglobin level of 15 g/dL and a serum creatinine of 2.1 mg/dL.

◆ What is the most likely diagnosis?

◆ What is the next step in therapy?
ANSWERS TO CASE 5: Toxic Shock Syndrome

**Summary:** A 28-year-old woman has fever to 102°F, myalgias, vomiting, hypotension, confusion, and a sunburn-like rash. She has evidence of hemoconcentration and renal insufficiency.

♦ **Most likely diagnosis:** Toxic shock syndrome.

♦ **Next step in therapy:** Isotonic intravenous fluids, intravenous nafcillin, monitor urine output and blood pressure, and support blood pressure with dopamine if needed.

**Analysis**

**Objectives**

1. Recognize the manifestations of shock.
2. Understand that *Staphylococcus aureus*, acting through an exotoxin, causes toxic shock syndrome (TSS).
3. Understand that aggressive fluid resuscitation and intravenous nafcillin (or vancomycin) are fundamental in the treatment of TSS.

**Considerations**

The most significant issue for this patient is the hypotension, since her blood pressure is 60/40. Her mean arterial pressure is 47 mm Hg, which is insufficient to maintain cerebral perfusion. **Regardless of the etiology, the blood pressure needs to be supported immediately.** Because the patient has a fever of 102°F with the hypotension, and no history of hemorrhage or pregnancy (ectopic), septic shock is the most likely diagnosis. **The first step in resuscitation should therefore be addressed at supporting the blood pressure, with aggressive use of intravenous isotonic fluids.** A Foley catheter measuring urine output can help to assess urine output and indirectly kidney perfusion, particularly since the patient has an elevated serum creatinine level. The goal is to
keep the mean arterial blood pressure at least 65 mm Hg to perfuse her vital organs. Ideally, this patient would have a urine output of at least 25 to 30 mL per hr (depending on the degree of renal insufficiency). Furthermore, this woman most likely has toxic shock syndrome (TSS) since she has myalgias, fever, nausea and vomiting, and sunburn-like rash. Desquamation of the skin would be even more typical for TSS.

**APPROACH TO TOXIC SHOCK SYNDROME**

**Definitions**

**Toxic shock syndrome (TSS):** an acute febrile illness usually caused by the exotoxin of *Staphylococcus aureus* that leads to multiorgan dysfunction.

**Shock:** Condition of circulatory insufficiency where tissue perfusion needs are not met.

**Septic shock:** Circulatory insufficiency due to infection or the body’s response to infection, commonly caused by gram-negative endotoxins.

Mean arterial pressure (MAP) = \([2 \times \text{Diastolic blood pressure}] + (1 \times \text{Systolic blood pressure})]/3\]

**Pathophysiology**

Toxic shock syndrome (TSS) was first described by Todd in 1978 in children who died due to *S. aureus* infections. Since the 1980s, 95% of patients with TSS were young healthy, menstruating women, with *S. aureus* isolated in the vast majority of cases. The use of barrier contraceptives and tampons are predisposing factors. The TSS exotoxin-1 leads to the syndrome possibly due to tumor necrosis factors and interleukins and other cytokines. The *S. aureus* organisms are in the vagina, and the exotoxins enter the circulation through microulcerations of the vagina. Most women experience a flu-like illness, fever, rash, sore throat, vomiting, and diarrhea. The skin changes are most characteristic: the intense sunburn-like rash develops during the
first 48 hr, and after several days becomes maculopapular, similar to a drug-related rash. After 10 days, the rash typically desquamates including involvement of the palms and soles.

The management of TSS includes copious intravenous fluids with close monitoring of urine output and blood pressure. At times, invasive hemodynamic monitoring with a central venous catheter or Swan-Ganz line is needed. **Intravenous nafcillin or methicillin is usually the best antibiotic therapy; when the diagnosis is unclear, an aminoglycoside agent is often added for gram-negative coverage.** Dopamine or dobutamine are sometimes required when fluids alone are insufficient to maintain the blood pressure. Rarely, a toxic shock–like picture may be caused by other organisms such as group A beta-hemolytic streptococcus.

**Comprehension Questions**

[5.1] Each of the following statements about toxic shock syndrome (TSS) is true except:

A. The symptoms are largely caused by an exotoxin.
B. Intravenous nafcillin is the initial antibiotic of choice.
C. Tampon use is a predisposing factor.
D. **S. aureus** is typically cultured from the blood.
E. The vagina is a common site of infection.

[5.2] Which of the following describes the usual sequence of skin changes in TSS?

A. Sunburn rash to desquamation to maculopapular rash
B. Maculopapular rash to sunburn rash to desquamation
C. Sunburn rash to maculopapular rash to desquamation
D. Hypotension to sunburn rash

[5.3] Each of the following is a typical manifestation of TSS except:

A. Hypotension
B. Elevated serum creatinine
C. Elevated serum bilirubin level  
D. Elevated serum liver function test  
E. Thrombophilia

[5.4] Each of the following is a fundamental principle for the treatment of septic shock except:

A. Remove the nidus of infection  
B. Plasmaphoresis  
C. Fluid resuscitation  
D. Support the blood pressure

**Answers**

[5.1] **D.** The *S. aureus* organism is usually isolated from the vagina and not from the blood, since its effects are mediated by the exotoxins. The most common location of the organisms is the vagina, and often there is vaginal erythema present.

[5.2] **C.** The typical sequence of changes in skin lesions of toxic shock syndrome are sunburn-like rash to maculopapular rash to desquamation.

[5.3] **E.** Usually, TSS causes thrombocytopenia rather than thrombophilia (elevated platelet count). Dysfunction of the kidneys or liver is also common.

[5.4] **B.** Plasmaphoresis is not a major part of the treatment of septic shock.
CLINICAL PEARLS

- The initial treatment of septic shock includes aggressive intravenous fluids and antibiotic therapy.
- The sunburn-like rash and/or desquamation is typical for Staphylococcal aureus infections.
- The initial antibiotic therapy for serious S. aureus infections is generally intravenous nafcillin or methicillin unless methicillin resistance is suspected, in which case vancomycin is used.

REFERENCES