

Diagnosis & Management of Hemodialysis Catheter Infections

Vandana Dua Niyyar, MD, FASDIN
Associate Professor of Medicine
Emory University
Atlanta

Case # 1

- 65 y/o elderly male
- DM, HTN, CAD
- ESRD for 3 months
- Access RIJ tunneled catheter, placed in he hospital when he started dialysis
- Now presents with pain and discharge at the exit site X 2 days

Case # 1 (contd)

- O/E: Exit site inflamed, tender
- Crusting around the exit site
- No discharge
- VS: T 97.6 F, P 76, BP 136/82 mm Hg
- How do you proceed?

Medscape



Source: Kidney Int © 2011 International Society of Nephrology

Sites of Catheter-related Infections

- Local infection:

- ◆ Exit site infection
- ◆ Tunnel infection

- Systemic infection:

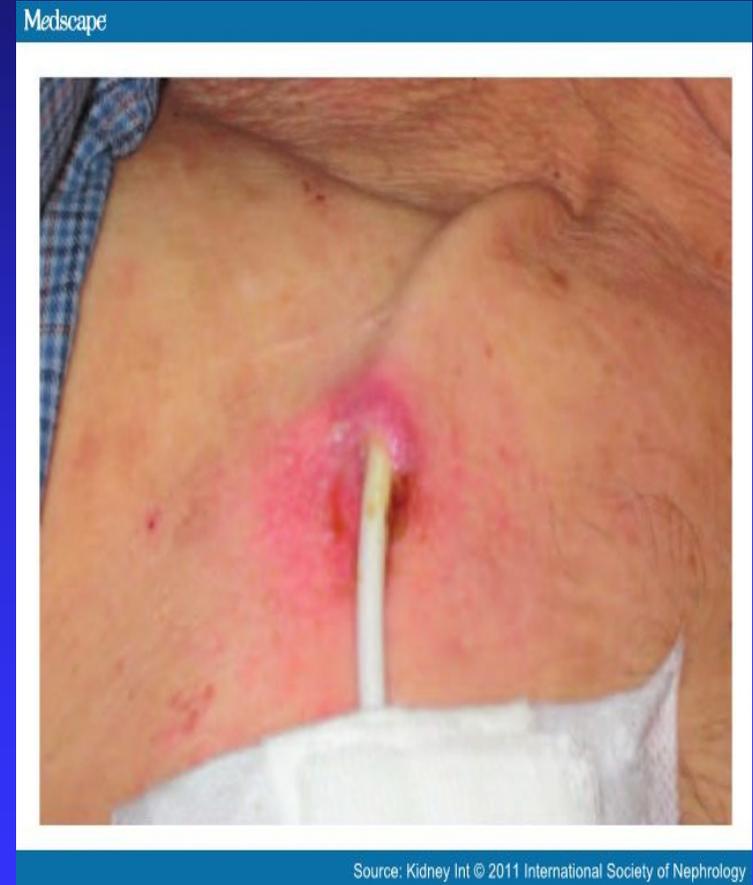
- ◆ Catheter related bacteremia (CRB)

Catheter-related Bacteremia: Metastatic Infections

- Frequent - 20 to 30%
 - ◆ Septic arthritis
 - ◆ Endocarditis
 - ◆ Epidural abscess
 - ◆ Death - 6 to 18%

Exit Site Infection

- Erythema, swelling, tenderness, purulent drainage
- Inflammation confined to the area surrounding the catheter exit site, not extending superiorly beyond the cuff if the catheter is tunneled, with exudate culture confirmed to be positive
- *Rx: Local antibiotics*



Tunnel Infection

- Tunnel infection:

- ◆ The catheter tunnel superior to the cuff is inflamed, painful, and may have drainage through the exit site that is culture positive
- ◆ *Rx: Systemic antibiotics*
- ◆ *CVC exchange with new tunnel and exit site*

Case # 2

- 65 y/o elderly male
- DM, HTN, CAD
- ESRD for 6 months
- Access RIJ tunneled catheter, placed in he hospital when he started dialysis
- Now presents with fever and chills on dialysis
- No overt sign of infection at the exit site/tunnel
- No other source of infection

Case #2 (contd)

- O/E: T 102 F, P 120/min, BP 140/84 mm Hg
- What do you do now?

- What if:
- T 102 F, P 120/min, but BP 90/60 mm Hg
- How would your management differ?

Catheter-related Bacteremia: Pre-disposing factors

HOST RELATED FACTORS

- Older age
- Diabetes mellitus
- Impaired immunity
- Poor personal hygiene

PATHOGEN RELATED FACTORS

- Biofilm Formation
- Antibiotic resistance
- Bacterial virulence
- *Staph aureus* nasal carriage

CATHETER RELATED FACTORS

- Site of insertion
- Lack of aseptic precautions during insertion
- Duration of catheter use
- Colonization of S/C tract with skin flora
- Catheter lumen contamination
- Hematogenous seeding from another infectious source

Catheter-related Bacteremia: Treatment Options

■ Two issues:

- ◆ **Antibiotic treatment** - immediate and prolonged
 - ◆ Systemic
 - ◆ And / Or Anti-microbial lock solutions
- ◆ **Catheter management** - alternatives
 - ◆ Leave it in – “treat through the infection”
 - ◆ Guidewire exchange
 - ◆ Guidewire exchange with new tunnel and exit site
 - ◆ Remove - delay replacement

Catheter Management

- Leave it in – “treat through the infection”
 - ◆ Only systemic antibiotics
 - ◆ 75% recurrence rate once antibiotic course is completed
- Remove - delay replacement
 - ◆ Most labor-intensive, though optimal
 - ◆ Two procedures
 - ◆ Challenging in patients with limited access sites

Catheter Management

- Guidewire exchange
 - ◆ Cure rates similar to removal, while removing the number of access procedures required
 - ◆ “Nephro-centric” approach – preserves access sites while providing comparable success in eradicating infections

Antibiotic Dosing in HD patients – Clinical Pearls

- Empiric therapy should include Vancomycin (Gram positive) with either aminoglycosides or 3rd generation cephalosporins (Gram negative)
- Select antibiotics that can be dosed after dialysis
 - ◆ Vancomycin
 - ◆ Aminoglycosides
 - ◆ Ceftazidime
 - ◆ Cefazolin

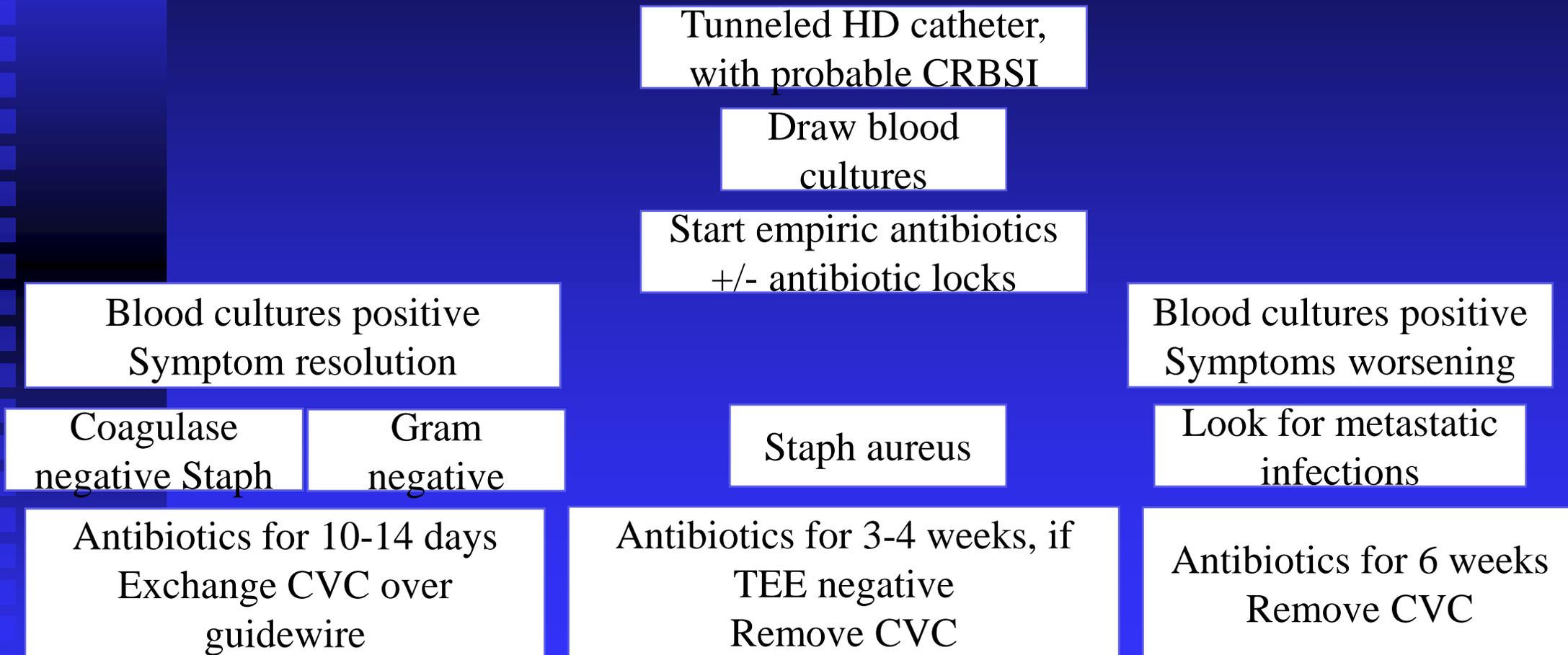
Antibiotic Dosing in HD patients

Systemic Antibiotics				
Antibiotic	Dosing Regimen			
Vancomycin	20-mg/kg loading dose infused during the last hour of the dialysis session, then 500 mg during the last 30 min of each subsequent dialysis session			
Gentamicin (or tobramycin)	1 mg/kg, not to exceed 100 mg, after each dialysis session			
Ceftazidime	1 g IV after each dialysis session			
Cefazolin	20 mg/kg IV after each dialysis session			
Daptomycin	6 mg/kg after each dialysis session			
Antibiotic Lock				
Type of Lock Solution	Volume of Solution (mL)			
	Vancomycin*	Ceftazidime†	Cefazolin‡	Heparin‡
Vancomycin/ceftazidime	1.0	0.5	—	0.5
Vancomycin	1.0	—	—	1.0
Ceftazidime	—	1.0	—	1.0
Cefazolin	—	—	1.0	1.0

Antibiotic Dosing in HD patients – Clinical Pearls

- Lock therapy – May be used for eradication of CRB to attempt to preserve vascular access sites
- High local concentrations of antibiotics (100-fold > therapeutic plasma concentrations)
- Cure rate dependent on type of organism
 - ◆ 85-100% Gram negative
 - ◆ 75-84% *Staph epidermidis*
 - ◆ 61% *Enterococcus*
 - ◆ 40-55% *Staph aureus*

Summary: Catheter-related Bacteremia Management Algorithm



SUMMARY

- “The greatest risk....to human health comes in the form of antibiotic-resistant bacteria. We live in a bacterial world where we will never be able to stay ahead of the mutation curve. A test of our resilience is just how far behind the curve we allow ourselves to fall.” – *World Economic Forum*

- **LINES LAST**