

Enterococcal Cardiac Implantable Electronic Device (CIED) Infections: Clinical Features and Outcomes

Timothy S. Oh, BS, James E. Peacock Jr., MD for the MEDIC Investigators*
Wake Forest School of Medicine, Winston-Salem, North Carolina, USA

Introduction

Enterococci cause both native and prosthetic valve infective endocarditis (IE). Cardiac infections due to enterococci pose therapeutic challenges because of the need to utilize synergistic therapy to achieve optimal outcomes and problems with emerging resistances. Among cardiac enterococcal infections, enterococcal CIED infections have not been well described.

Methods

Data from the Multicenter Electrophysiologic Device Infection Collaboration (MEDIC), a prospective, observational, multinational cohort study of CIED infections due to enterococcal species. Adult patients ≥18 years old were enrolled from January 2009 to August 2012. Patient charts were reviewed for clinical, microbiological, and imaging data which were recorded in a standardized electronic database.

Results

From a database of 433 patients, 21 (4.8%) were diagnosed with enterococcal CIED infection (**Figure 1**). Specific data on enterococcal species were not recorded. The mean age was 70.8 years and 81% were male. Twelve patients (57%) had permanent pacemakers, 5 (24%) had implantable cardioverter defibrillators, and 4 (19%) had biventricular devices. No patient had a history of a previous CIED infection. Six patients (29%) were on hemodialysis, 9 (43%) had prosthetic valves, and 12 (57%) had diabetes. No patient underwent a GI or GU procedure in the 90d preceding diagnosis of infection. The median Charlson Comorbidity Index (CCI) of all 21 patients was 6 (2% estimated 10-year survival). Among the 21 infections, 3 (14%) were categorized as CIED-related bloodstream infections and 18 (86%) as IE; no patient had isolated pocket infection. Of the IE cases, 4 (22%) were valvular IE, 8 (44%) were lead IE, and 6 (33%) were both. Of the 10 valvular IE cases, 6 were native valve IE, 1 was prosthetic valve IE, and 3 were unknown. Fourteen cases of IE (78%) were definite by the Duke criteria whereas 4 (22%) were possible. Only 14 patients (67%) underwent complete device removal (median CCI 7); the 7 patients who retained their device were judged to be at high risk for explantation (median CCI 6).

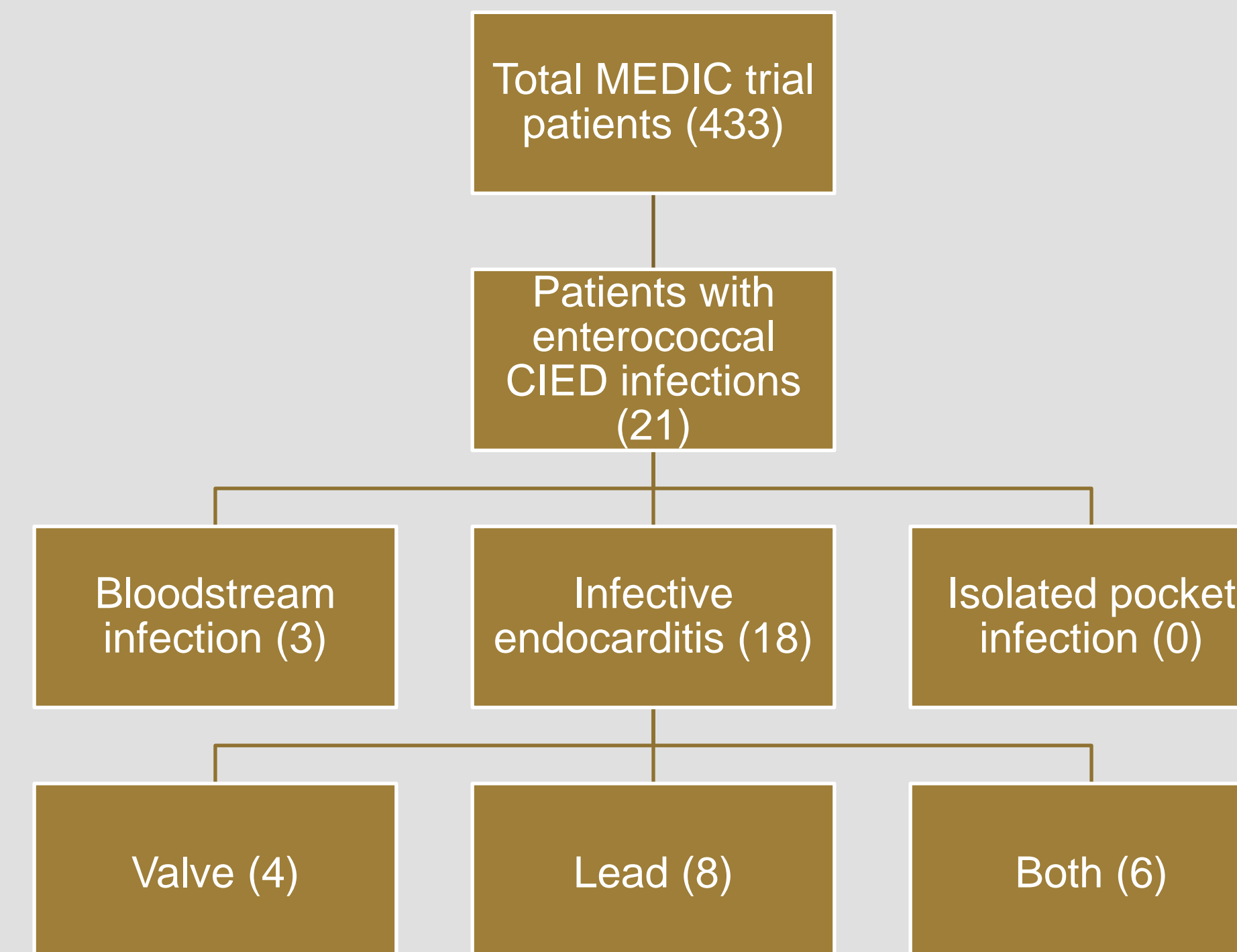


Figure 1: Study Population and Types of CIED Infections

All patients received antimicrobial therapy with the most common regimen being a penicillin plus aminoglycoside (38%); the regimens utilized are shown in **Figure 2**. Antibiotics were given for a median of 43d.

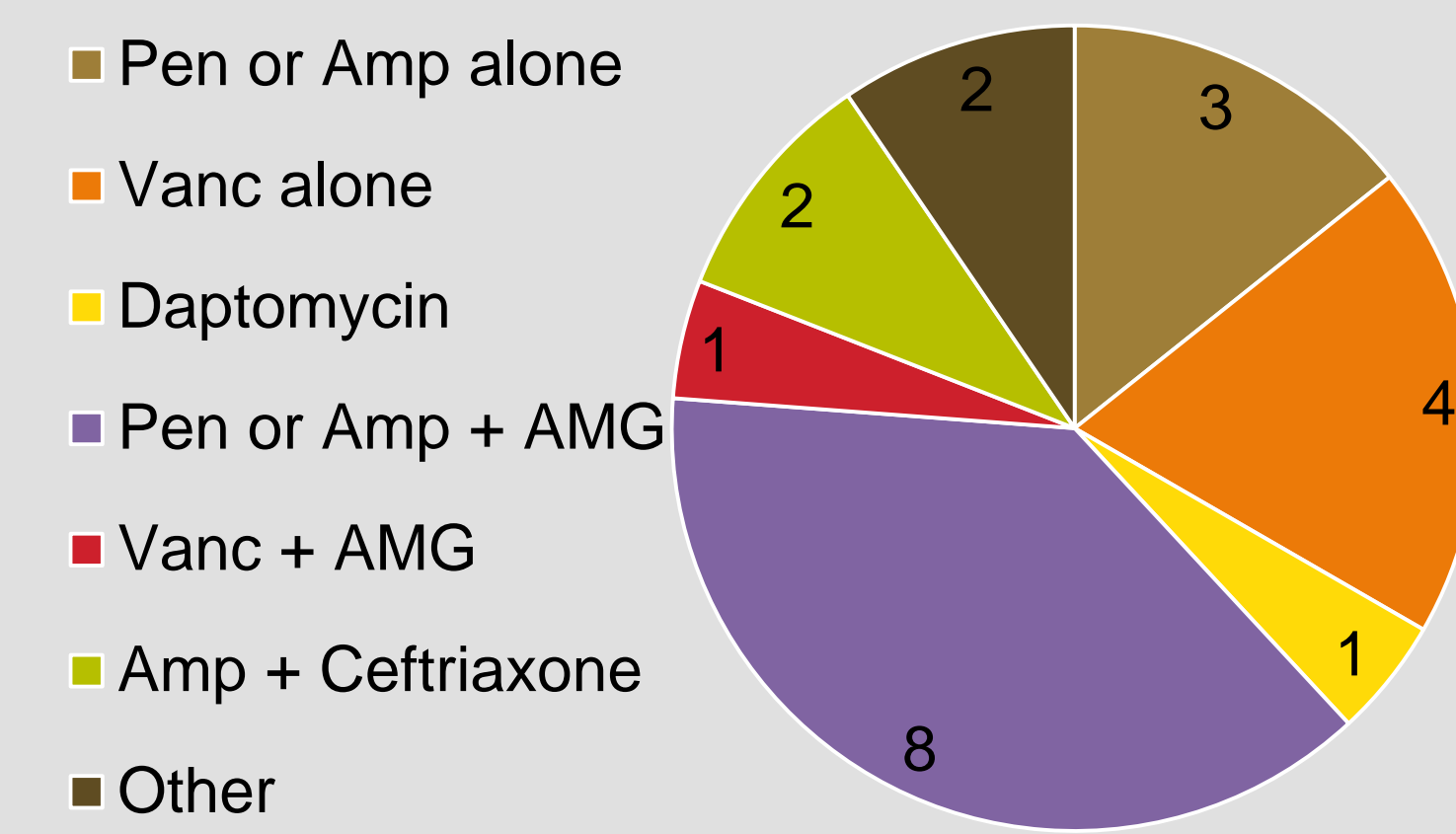


Figure 2: Antimicrobial Therapy of Enterococcal CIED Infection (n=21)
Abbreviations: Pen = Penicillin; Amp = Ampicillin; Vanc=Vancomycin; AMG=Aminoglycoside

Table 1. Clinical Features of Patients with Enterococcal CIED Infections (n=21)

Characteristic	Result
Total procedures prior to infection, median (range)	1 (1-3)
Days from last device procedure to infection, median (range)	510 (37-2952)
Presenting symptoms	
Fever, n (%)	10 (48)
Local signs of generator pocket infection, n (%)	5 (24)
Days from symptom onset to diagnosis of infection, median (range)	10 (1-62)
Echocardiography	
Number of TTEs positive for vegetations / Number of TTEs done (%)	3/13 (23.1)
Number of TEEs positive for vegetations / Number of TEEs done (%)	17/21 (81)
Microbiology	
Patients with positive blood cultures for enterococci, n (%)	21 (100)
Number of positive blood cultures per patient for Enterococcus spp, mean	4.3
Management	
Days of antibiotic therapy, median (range)	43 (7-60)
Patients given suppressive antibiotic therapy, n (%)	4 (20)
Complete removal of CIED, n (%)	14 (67)
New CIED implanted after removal, n (%)	4 (28.6)

There was 1 death during the index hospitalization. At 6 months post-therapy, there were no documented relapses but 4 additional patients had died (overall mortality 24%) (**Figure 3**).

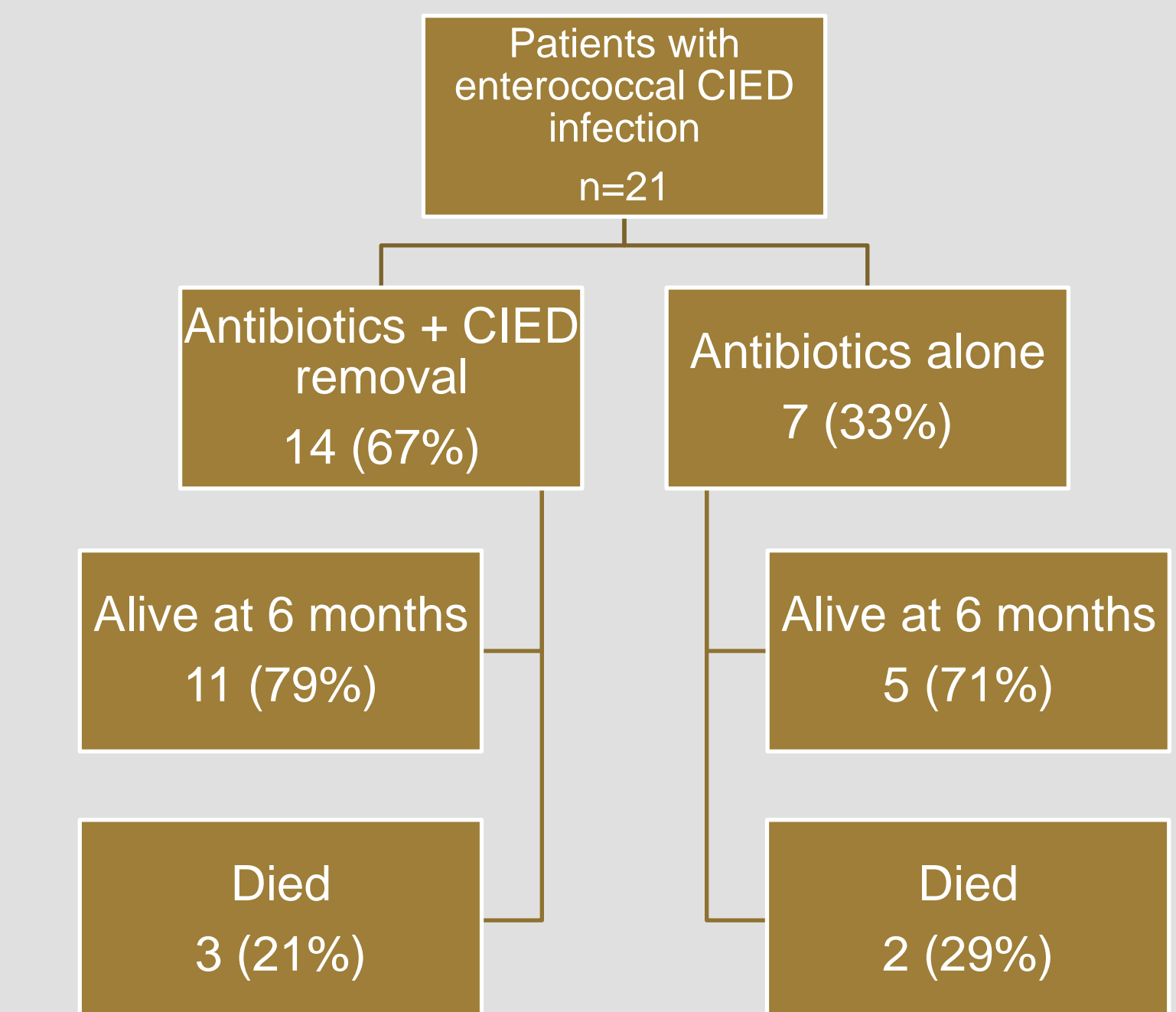


Figure 3: Management and Outcomes of CIED Infection

Conclusions

- Enterococci accounted for 4.8% of all CIED infections in our cohort.
- IE was the most common infectious syndrome with 33% of patients having involvement of both valves and device leads. No pocket infections were documented.
- Infection typically occurred more than 1 year after the last device manipulation and most likely occurred via bloodborne seeding of the device.
- Somewhat surprisingly, device removal occurred in only 67% of patients.
- A penicillin plus aminoglycoside was the most usual antibiotic regimen with therapy typically given for 6 weeks.
- At 6 months follow-up, no relapses of infection had been documented but overall mortality was 24%.

References

1. Sohail MR, Uslan DZ, Khan AH, et al. Management and outcome of permanent pacemaker and implantable cardioverter-defibrillator infections. *J Am Coll Cardiol* 2007; 49:1851-59.
2. Baddour LM, Epstein AE, Erickson CC, et al. Update on cardiovascular implantable electronic device infections and their management: a scientific statement from the American Heart Association. *Circulation* 2010; 121:458-77.
3. Chirouze C, Athan E, Alla F, et al. Enterococcal endocarditis in the beginning of the 21st century: analysis from the International Collaboration on Endocarditis-Prospective Cohort Study. *Clin Microbiol Infect* 2013; 19:1140-7.
4. Madhavan M, Sohail MR, Friedman PA, et al. Outcomes in patients with cardiovascular implantable electronic devices and bacteremia caused by Gram-positive cocci other than *Staphylococcus aureus*. *Circ Arrhythm Electrophysiol* 2010; 3:639-45.