Management and Outcomes of Cardiovascular Implantable Electronic Device Infections due to Gram-Negative Bacteria

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Background

• Infection is a potentially life-threatening complication of cardiovascular implantable electronic device (CIED) therapy. Since the large majority of these cases are due to staphylococcal species, scant data exist for CIED infections (CIEDI) due to gram-negative bacilli (GNB).

Methods

• We retrospectively screened our institutional device database from 1992 to 2016 to identify cases of CIEDI due to GNB. Infections within 12 weeks following implantation or last invasive device manipulation were defined as early-onset. Relapse was described as infection with the same organism despite device explantation and appropriate antimicrobial therapy, based on susceptibility results.

Results

Of the 827 CIEDI cases during the study period, only 32 (4%) were caused by GNB. Median patient age was 65 years (SD±14), and 78 % (25/32) were male. Early-onset infection was the more common presentation [53% (17/32)]. Regardless of timing of onset, the majority [75% (24/32)] presented with generator pocket infection, of whom 3 (13%) had lead erosion. Five patients presented with bloodstream infection, 4 had concomitant pocket infection, and 1 had no signs of local infection. CIED-related endocarditis was seen in 9% (3/32) of patients. Two patients had a primary infection at a different anatomical site with the same causative organism 6 months prior to presentation. The most common organisms were Pseudomonas aeruginosa (22 %, 7/32) and Serratia species (19 % 6/32). Most (94 %, 30/32) patients underwent complete device removal. Antimicrobial duration was based on infection syndrome and 50% completed therapy with an oral antibiotic. Only 2 patients had infection relapse and one of them died due to septic shock following device extraction.

Discussion

CIEDI due to GNB are uncommon, and most patients present with early-onset generator pocket infection. Cure is achievable with complete device removal and pathogen-directed antimicrobial therapy. For local infection, patients can be switched to oral antimicrobials, based on susceptibility data, after device explanation to complete 10 to 14 days of treatment. Infection relapse is rare.

References

Figure 1. Microbiology of GNB CIEDI in the 32 patients

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- Acinetobacter spp.: 3%
- Enterobacter cloacae complex: 9%
- Klebsiella pneumoniae: 16%
- Pseudomonas aeruginosa: 22%
- Morganella morgani: 6%
- Serratia marcescens: 15%
- Citrobacter Koseri: 3%
- Achromobacter xylosoxidans: 3%
- Stenotrophomonas maltophilia: 6%
- E. coli: 15%
- Enterobacter dioicae complex: 9%
- Serratia species: 19%
- Escherichia coli: 13%
- K. pneumoniae: 16%
- Stenotrophomonas maltophilia: 6%
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