Gram-Negative Bacterial Endocarditis with Negative Transesophageal Echocardiograms

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Introduction

Prosthetic valve endocarditis makes up 20% of all cases of endocarditis[2]. Furthermore, the sensitivity of a Transesophageal Echocardiogram (TEE) in finding abnormalities in subacute bacterial endocarditis is 85-90% and the specificity is around 90%.[2,4] On the other hand, a Transthoracic Echocardiogram (TTE) has a sensitivity of 45-75% and specificity from 85-98%.[3] Thus, the rationale for obtaining a TEE after a negative TTE is due to the poorer sensitivity of the TTE[1]. The current expert recommendation is that TEE should be the preferred diagnostic tool over a TTE for infectious endocarditis after a failed TTE.[1,2,3]

Figures

Table 3. **Treatment and Outcome of Non-HACEK Gram-Negative Bacillus Endocarditis, according to the Infecting Organism***

Organism	Patients Infected, n	Antibiotic Treatment, n/n (%)	Surgical Treatment, n/n (%)	Complications, n/n (%)†	In-Hospital Mortality, n/n (%)
Escherichia coli	14	Monotherapy with β-lactam: 5/14 (36) Combination therapy: 9/14 (64)‡	4/14 (29)	11/14 (79)	3/14 (21)
Pseudomonas aeruginosa	11	Monotherapy with aminoglycoside: 3/11 (27) Combination therapy: 8/11 (73)§	6/11 (55)	8/11 (73)	4/11 (36)
Klebsiella species	5	Monotherapy: 4/5 (80)‖ Combination therapy: 1/5 (20)¶	2/5 (40)	2/5 (40)	2/5 (40)
Serratia species	4	Monotherapy: 0/4 (0) Combination therapy: 4/4 (100)**	4/4 (100)	3/4 (75)	0/4 (0)
Other	15	Monotherapy with β-lactam: 6/15 (40) Combination therapy: 8/15 (53)†† Missing: 1/15 (7)	9/15 (60)	10/15 (67)	3/15 (20)

* HACEK = *Haemophilus* species, *Actinobacillus actinomycetemcomitans*, *Cardiobacterium hominis*, *Eikenella corrodens*, or *Kingella* species.
† Defined as paravalvular complications, intracardiac abscess, conduction abnormality, persistently positive blood cultures, stroke, other systemic embolization, or congestive heart failure.
‡ β-Lactam + aminoglycoside (6 of 14); β-lactam + aminoglycoside + quinolone (2 of 14); β-lactam + quinolone (1 of 14).
§ β-Lactam + aminoglycoside (5 of 11); β-lactam + quinolone (2 of 11); aminoglycoside + quinolone (1 of 11).
‖ β-Lactam (3 of 5); quinolone (1 of 5).
¶ β-lactam + quinolone (1 of 5).
** β-Lactam + quinolone (2 of 4); β-lactam + aminoglycoside (2 of 4).
†† β-Lactam + aminoglycoside (4 of 15); β-lactam + quinolone (2 of 15); β-lactam + quinolone + trimethoprim–sulfamethoxazole (1 of 15); β-lactam + trimethoprim–sulfamethoxazole (1 of 15).

Figure 1:
Treatment and outcomes for Non-HACEK Gram-Negative Bacterial Endocarditis.[6]

Conclusions

- TEEs are superior compared to TTEs when diagnosing bacterial endocarditis. However, TEEs will not catch all cases of bacterial endocarditis and care should be made to evaluate the entire clinical picture.

Case Report

A 66-year-old male underwent a successful bovine aortic valve replacement in 2013. In 2015, the patient was admitted to the hospital with neurological symptoms consistent with a TIA. He had a standard work up for TIA which included a TTE. All of the tests were unremarkable and he was discharged home on clopidogrel. Two weeks later, the patient came into the hospital with right knee pain and swelling, as well as fevers, chills and rigors. During that admission he had an arthrocentesis of his right knee, as well as blood cultures which grew *Pseudomonas aeruginosa*. In order to look for a source of infection, the patient underwent a TEE which was negative for valvular vegetation, dysfunction, or heart failure. After more unremarkable testing the patient was discharged on broad spectrum antibiotics.

Three weeks post-discharge, he was taken off the antibiotics and subsequently developed fever, chills, and rigors. Once again, his blood cultures grew *Pseudomonas aeruginosa*. His work up during this admission included another TEE which was unremarkable. The patient had consultations with Cardiology and Cardiovascular Surgery who did not suspect that his illness was related to subacute bacterial endocarditis because of the two negative TEEs.

The patient was seen in the outpatient office within a week's time because he was still suffering from malaise, chills, and fatigue despite antibiotics. Subsequently, the patient transferred to a tertiary care center where a third TEE was performed which was still unremarkable. Despite this, the decision was made to remove the old bovine valve and replace it with an artificial valve. Once removed, the old valve was cultured and grew *Pseudomonas aeruginosa*. The patient has subsequently made a full and complete recovery.

Discussion

Interestingly, despite the high sensitivity and specificity associated echocardiography, no abnormalities were appreciated on the three TEEs performed in this patient. Another puzzling element to this case is when present on culture, bacterial endocarditis is most likely to be caused by gram positive bacteria (60-80%), while gram-negative bacteria such as *Pseudomonas aeruginosa* are rarely identified (1.8%) as the pathogens.[1,6] In hindsight, the original diagnosis of a TIA could have been a septic embolus from the infected heart valve. This case demonstrates that even when testing appears to be "normal," the patient's physical examination and history can lead the clinician to the appropriate diagnosis.

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