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Distribution of Streptococcal Species Causing Infective Endocarditis

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Abstract

Background: Streptococci as a group remain an important cause of infective endocarditis (IE). With improvements in diagnostic technology, causative pathogens are now more easily identified to the species level. The purpose of this study was to describe the distribution of streptococcal groups causing IE.
Methods: Adult patients with definite IE (Duke Criteria) admitted to the hospital from July 1, 2007 to December 31, 2014, were identified from the Cleveland Clinic Infective Endocarditis Registry. Blood culture, valve culture, and valve sequencing (University of Washington) results were examined to describe the distribution of streptococcal species. The streptococci were grouped according to the Bergey's Manual of Systematic Bacteriology.
Results: A total of 294 patients had ≥1 episodes of streptococcal IE during the study period of which 68% (200) were native valve IE. The mean (± SD) patient age was 58 ± 14 years; 73% (216) were men. The overall distribution of streptococci was: 76% viridans (n= 224); 17% pyogenic (50); 6% nutritionally variant (17), and 1% anaerobic (3). Sixty-three (21%) of the viridans group streptococci were not identified further. The distribution of the remaining 161 viridans group streptococci was as follows: mitis group 99 (61%), bovis group 24 (15%), mutans group 21 (13%), anginosus group 15 (9%), and salivarius group 2 (1%). Of the 50 pyogenic streptococci, 39 (78%) were *S. agalactiae* and 8 (16%) were *S. dysgalactiae*. Of the 17 nutritionally variant streptococci 9 (53%) were *Granulicatella spp.*, the remaining 8 (47%) were *Abiotrophia spp.*
Conclusion: Viridans group streptococci are the cause in 76% of cases of streptococcal IE. Mitis group streptococci are by far the most common viridans group streptococci causing IE. Pyogenic streptococci cause about 17% of all cases of streptococcal IE, with *S. agalactiae* accounting for almost 80% of IE caused by pyogenic streptococci.

Introduction

- Streptococci are the second leading cause of infective endocarditis (IE) after staphylococci.
- The *Streptococcus* genus comprises more than 100 identified species.
- Improved diagnostic modalities have allowed for more accurate species level identification of streptococci.
- This study was undertaken to determine the relative frequencies of different streptococci that cause IE.

Methods

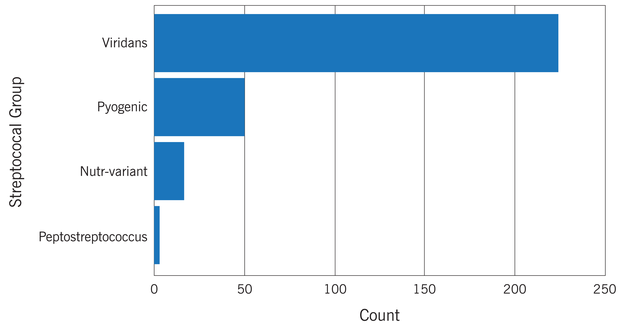
- Adult patients with streptococcal IE (definite IE by Duke Criteria) admitted to the hospital from July 1, 2007 to December 31, 2014, were identified from the Cleveland Clinic Infective Endocarditis Registry. The first episode of streptococcal IE per patient was included.
- Results of blood culture, valve culture, and valve sequencing (University of Washington) were examined to determine the streptococcal species.
- The streptococci were grouped according to the Bergey's Manual of Systematic Bacteriology.

Results

There were a total of 294 episodes of streptococcal IE during the study period, of which 200 (68%) were native valve IE. The mean (± SD) patient age was 58 ± 14 years; 216 (73%) were in men. The numbers of valves affected were as follows: aortic 122 (41%), mitral 99 (34%), aortic and mitral 57 (19%), and all others 16 (6%). One hundred four episodes of IE (35%) had invasive disease. Two hundred forty-four patients (83%) were treated surgically.

Streptococci

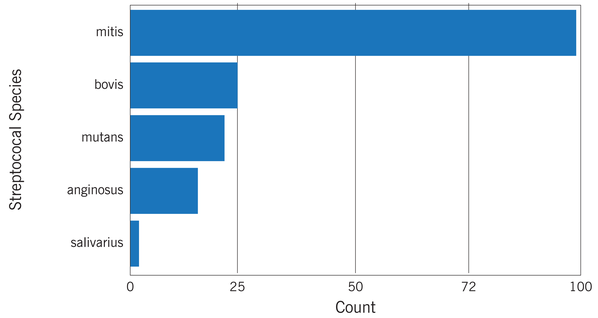
Figure 1.
Frequency distribution of streptococcal groups causing IE



Viridans group streptococci

Viridans group streptococci accounted for 224 episodes of IE (76% of all streptococcal IE). Sixty-three (21%) of the viridans group streptococci were not identified further. The frequency distribution of the remaining 161 viridans group streptococci causing IE (Figure 2).

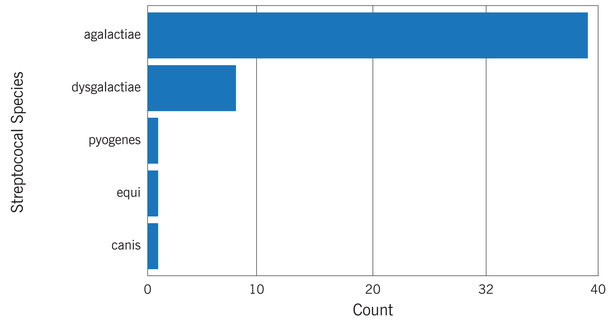
Figure 2.
Frequency distribution of viridans group streptococci causing IE



Pyogenic streptococci

Pyogenic streptococci were the causative pathogens in 52 episodes of IE (17% of streptococcal IE).

Figure 3.
Frequency distribution of pyogenic streptococci causing IE



Other streptococci

Of the 17 episodes of IE caused by nutritionally variant streptococci, 9 (53%) were caused by *Granulicatella spp.*, the remaining 8 (47%) by *Abiotrophia spp.*

Peptostreptococci were the causative pathogen in 3 episodes of IE (1% of streptococcal IE).

Associations with streptococcal group

Table 1.
Associations of selected clinical features with streptococcal group

Clinical feature[1]	Viridans (n = 224)	Pyogenic (n = 50)	Other (n = 20)	p-value[2]
Age on admission	57 (15)	62 (12)	58 (11)	0.15
PVE	67 (30)	16 (32)	11 (55)	0.07
Male sex	170 (76)	29 (58)	17 (85)	0.02
Valves affected				0.64
AV	99 (44)	23 (46)	6 (30)	
MV	75 (34)	19 (38)	8 (40)	
AV+MV	45 (20)	8 (16)	6 (30)	
Right sided only	5 (2)	0	0	
Invasive disease	71 (32)	24 (48)	9 (45)	0.06
Surgically treated	188 (84)	37 (74)	19 (95)	0.08

[1]Expressed as mean (standard deviation) for continuous variables, and count (percentage) for categorical variables.

[2]ANOVA for continuous variables and chi square test for categorical variables.

Abbreviations: PVE, prosthetic valve endocarditis; AV, aortic valve; MV, mitral valve.

Conclusions

Viridans group streptococci are the cause in 76% of cases of streptococcal IE. Mitis group streptococci are by far the most common viridans group streptococci causing IE. Pyogenic streptococci cause about 17% of all cases of streptococcal IE, with *S. agalactiae* accounting for almost 80% of IE caused by pyogenic streptococci.