The Most Common Organisms in Periprosthetic Joint Infection: A Survey of the International Orthopaedic Device Infection Network

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INTRODUCTION:

Periprosthetic joint infection (PJI) remains a major source of morbidity, mortality, and economic burden, both in the United States (US) and internationally. Understanding regional microbiology profiles in PJI is essential to assist with empiric antibiotic selection. The purpose of this study was to survey the Orthopaedic Device Infection Network (ODIN) to determine the international microbiological profile of hip and knee PJI.

METHODS: ODIN is a multi-center, international database that includes all patients admitted to a participating hospital with a confirmed diagnosis of PJI . In the present study, ODIN data from four institutions in the following cities were retrospectively reviewed: Melbourne (AU, n=167), Groningen (NL, n=129), Weston and Cleveland (FL and OH, US, n=201), and Charlotte (NC, US, n=263). The ten most common organisms identified in hip and knee PJI were compared between institutions. Rates of polymicrobial, fungal, and culture-negative PJI specifically were also evaluated.

RESULTS: A total of 760 patients with PJI were included (335 hip, 425 knee). *Staphylococcus Aureus* was the most common organism identified in 3 institutions (AU 30%, FL and OH 23%, NC 29%), whereas *Staphylococcus Epidermidis* was the most common organism in Groningen (33%, Table 1). Rates of polymicrobial PJI were high and varied widely between institutions (14-54%, Table 2), whereas rates of fungal PJI were low and consistent between regions (2-3%, Table 3). The prevalence of culture-negative PJI varied between 8% (AU) and 22% (FL and OH, Table 4).

DISCUSSION AND CONCLUSION: While subtle regional differences in the microbiology of PJI exist, at least 49% of PJI at each center could be attributed to *Staphylococcus* species. With high rates of culture-negative PJI, this data could assist in selection of both empiric and prophylactic antibiotics.

Table 1: Prevalence of the top 10 most frequent causative organisms in each region

Rank	Melbourne, AU	Groningen, NL	Florida and Ohio, USA	North Carolina, USA
1	*Staphylococcus Aureus* 30% (50/167)	*Staphylococcus Epidermidis* 33% (43/129)	*Staphylococcus Aureus* 23% (47/201)	*Staphylococcus Aureus* 29% (75/263)
2	*Staphylococcus Epidermidis* 28% (47/167)	*Staphylococcus Aureus* 23% (29/129)	*Staphylococcus Epidermidis* 10% (32/201)	*Coagulase-Negative Staphylococcus* 15% (40/263)
3	*Staphylococcus Capitis* 11% (18/167)	*P. Acnes* 11% (15/129)	*P. Acnes* 8% (16/201)	*Staphylococcus Epidermidis* 13% (33/263)
4	*Enterococcus Faecalis* 10% (16/167)	*Staphylococcus Capitis* 9% (12/129)	*Staphylococcus Lugdenensis* 4% (8/201)	*Streptococcus Agalactiae* 6% (15/263)
5	*Staphylococcus Lugdenensis* 8% (13/167)	*Streptococcus Agalactiae* 6% (8/129)	*Staphylococcus Hominis* 3% (7/201)	*Enterococcus Faecalis* 5% (13/263)
6	*Escherichia Coli* 7% (11/167)	*Staphylococcus Lugdenensis* 5% (7/129)	*Corynebacterium Striatum* 3% (6/201)	*P. Acnes* 5% (13/263)
7	*Staphylococcus Hominis* 7% (11/167)	*Enterobacter Cloacae* 5% (7/129)	*Escherichia Coli* 3% (6/201)	*Pseudomonas Aeruginosa* 4% (10/263)
8	*Pseudomonas Aeruginosa* 6% (10/167)	*Escherichia Coli* 5% (6/129)	*Coagulase Negative Staphylococcus* 3% (5/201)	*Escherichia Coli* 3% (8/263)
9	*Proteus Mirabilis* 5% (8/167)	*Pseudomonas Aeruginosa* 4% (5/129)	*Streptococcus Agalactiae* 2% (4/201)	*Enterobacter Cloacae* 3% (8/263)
10	*Streptococcus Agalactiae* 5% (8/167)	*Staphylococcus Hominis* 3% (4/129)	*Pseudomonas Aeruginosa* 2% (4/201)	*Streptococcus Viridans* 3% (8/263)

Table 2: Rates of polymicrobial PJI in each region

Region	Total	Hip	Knee	p-value
Melbourne, AU	85/157 (54%)	47/85 (55%)	38/72 (53%)	0.68
Groningen, NL	58/129 (45%)	38/78 (49%)	20/51 (39%)	0.57
Florida/Ohio, USA	29/201 (14%)	19/88 (22%)	10/113 (9%)	0.25
North Carolina, USA	81/263 (31%)	31/106 (29%)	50/157 (32%)	0.51

Table 3: Rates of fungal PJI in each region

Region	Total	Hip	Knee	p-value
Melbourne, AU	5/167 (3%)	4/90 (4%)	1/77 (1%)	0.23
Groningen, NL	3/129 (2%)	0/51 (0%)	3/78 (4%)	0.28
Florida/Ohio, USA	6/201 (3%)	2/88 (2%)	3/113 (3%)	0.86
North Carolina, USA	8/263 (3%)	5/106 (5%)	3/157 (2%)	0.19

Table 4: Rates of culture negative PJI in each region

Region	Total	Hip	Knee	p-value
Melbourne, AU	13/167 (8%)	7/90 (8%)	6/77 (8%)	0.31
Groningen, NL	17/129 (13%)	5/78 (12%)	8/51 (16%)	0.68
Florida/Ohio, USA	45/201 (22%)	18/88 (20%)	27/113 (24%)	0.90
North Carolina, USA	45/263 (17%)	16/106 (15%)	29/157 (18%)	0.76