

QUESTION 2: Has the profile of organisms causing surgical site infection/periprosthetic joint infection (SSI/PJI) following orthopaedic procedures changed over recent years?

RECOMMENDATION: While the majority of organisms causing SSI/PJI continue to be staphylococcal species, the prevalence of resistant pathogens and atypical organisms continues to rise. In particular, incidence of methicillin-resistant *Staphylococcus aureus* (MRSA) is increasing. Isolated studies have reported an increased prevalence of culture-negative PJI. Further work regarding the flux in organism profile is needed, as it may confer significant antibiotic selection implications.

LEVEL OF EVIDENCE: Moderate

DELEGATE VOTE: Agree: 92%, Disagree: 5%, Abstain: 3% (Super Majority, Strong Consensus)

Data sources

Medline, Embase, Web of Science, Cochrane Library and reference lists of relevant studies from inception to February 10, 2018.

Selection criteria

Studies included were observational (prospective cohort, nested case-control or case-control, retrospective cohort) studies, case series and randomized controlled trials (RCTs) that have evaluated organism profile in PJI over time in patients undergoing orthopaedic procedures.

Review methods

Investigators screened and extracted data. We were not able to present a meta-analysis of the data. Thus, we present a narrative synthesis based on related data available.

Results

Of 113 potentially relevant citations, we found 23 relevant articles. Studies were observational and retrospective in design.

RATIONALE

Peersman et al. described that the predominant infectious organisms seen in 6,489 knee replacements were gram-positive (*Staphylococcus aureus*, *Staphylococcus epidermidis* and *Group B Streptococcus*) [1]. While current literature differs regarding specific percentages, there is consensus that gram-positive aerobic bacteria continue to remain the most common offending organisms [2–4].

In an aggregate of 14 studies examining 2,436 joints, *Staphylococcus aureus* represented 27% of all prosthetic joint infections, coagulase-negative *Staphylococcus* represented 27%, *Streptococcus* species were represented at 8%, *Enterococcus* species were represented at 3%, aerobic gram-negative bacilli made up 9%, anaerobic bacteria comprised 4%, culture-negative PJI was responsible for 14% and polymicrobial infection represented 15% [3–18]. In a study analyzing organism profile at 2 separate referral centers, *Staphylococcus aureus* remained the most prominent offending organism at 26.9% of cases [19]. Additional studies are congruent with the findings reported by Aggarwal et al. [2,19–21].

However, prevalence of resistant organisms continues to increase. In 2005, Ip et al. described a retrospective case series in which they described the bacterial isolates from 1995 to 2003 [22]. They noted that no isolates from 1995 and 1996 were multiple-drug resistant, a change observed in the later years [22]. McLawhorn et al. showed MRSA and methicillin-susceptible *S. epidermidis* (MRSE) combined to account for 18.1% of PJI pathogens in the United States [23]. Interestingly, a study analyzing prevalence of causative organisms at two separate tertiary centers showed methicillin resistance as significantly more common in the US than in Europe [19].

In summary, the mainstay of organisms causing SSI/PJI continue to be staphylococcal. The prevalence of resistant pathogens and atypical organisms also continues to rise. The prevalence of methicillin-resistant *Staphylococcus aureus* and culture-negative infection is also increasing. Further work regarding SSI/PJI organism profile is needed, as it may confer significant antibiotic selection implications.

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