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QUESTION 5: When a patient undergoes aseptic revision and intraoperative culture(s) grow an organism, should patients be treated with antibiotic therapy?

RECOMMENDATION: Antibiotic therapies are recommended if two or more cultures isolate the same organism, as per the MusculoSkeletal Infection Society (MSIS) and the International Consensus Group (ICG) criteria for prosthetic joint infections (PJIs). Antibiotic therapies may not be required when a single intraoperative culture isolates an organism. However, there may be circumstances when a single positive culture, combined with other tests, may indicate the presence of an infection and treatment would be indicated.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 90%, Disagree: 8%, Abstain: 2% (Super Majority, Strong Consensus)

RATIONALE

It is important to evaluate patients undergoing revision arthroplasty for evidence of infection. Most of these evaluations are performed preoperatively. Revision surgery is then performed when the patient appears to be clear of an infection. The incidence of positive operative cultures in this setting varies extensively from 0-44% and the significance of these positive cultures is often uncertain [1-3]. Studies of the clinical outcomes of patients with positive cultures at revision surgery have been mainly retrospective and have limited and inconsistent conclusions [3-10].

If two or more operative cultures grow the same microbe, then treatment for PJI would be appropriate, as per the MSIS and the ICG criteria for the diagnosis of PJI [11,12]. However, if only one operative culture has bacterial growth, then the likelihood of a culture contaminant increases. An old but valuable study by Atkins et al. in the microbiology literature can be helpful in this analysis [13]. This prospective study found that when three or more operative cultures are obtained, a single positive culture reflected PJI due to that organism 13.3% of the time; two positive cultures were indicative of PJI in 20.4% of patients and three or more cultures positive for the same organism signified a PJI in 94.8% of patients. Based on this data, the risk of treating a patient with a substantial course of antibiotic therapy may well out-weigh the benefit if a single positive culture is associated with PJI in only 13.3% of cases. Patients in this category can be observed without antibiotic therapy, with an appropriately-timed, postoperative arthroplasty aspirate culture to help determine if the operative bacterial isolate is a contaminant rather than a true pathogen.

Other issues in the present literature which limit us in making solid conclusions include:

1. Lack of standardization of operative culture specimens to be submissions of tissues or fluids, but not swabs.
2. Need to analyze operative culture positivity occurrences with knowledge of the duration of the surgery. Revision arthroplasty surgery is usually of longer duration than primary implantation and intraoperative culture-positivity may only be a surrogate marker for the duration of the surgery, particularly if the operative cultures are obtained toward the end of the surgery.
3. A single operative culture which grows an organism, which was the pathogen treated for a patient's prior PJI, needs to be analyzed separately from those which grow a microbe that is unrelated to any previous infection. Further analysis may find that, whereas growth of a prior known pathogen represents persistence of true infection, growth of a single, entirely different organism is likely to be a contaminant.
4. Although difficult to perform, prospective, controlled studies are much more likely to result in solid conclusions than retrospective analyses.

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