

SH38. How important is preoperative aspiration positive culture for diagnosis of PJI? Should it still be included in the minor criteria? If so, what weighted score should it be given in the diagnostic criteria?

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Methodology: A comprehensive literature review was performed to identify all studies on prophylactic/suppressive antibiotics after revision shoulder arthroplasty. Searches for the terms “shoulder replacement”, “aspiration”, “ICM”, “shoulder arthroplasty” and were performed using the search engines PubMed and Google Scholar which were searched through October 2024. Inclusion criteria for our systematic review were all English studies (Level I-IV evidence) that reported on the use of “aspiration” in establishing a diagnosis of PJI following shoulder arthroplasty. 18 articles met inclusion and exclusion criteria and were reviewed.

Answer: Based on a review of the literature, including both individual studies and systematic reviews while aspiration has a modest sensitivity in predicting infection or positive cultures at the time of revision arthroplasty it has a high specificity. It follows that a positive culture on preoperative aspiration should be still included in the minor criteria. Aspiration was assigned a weight of 3 points at the previous ICM and this should be maintained (at 3 points) due to its high sensitivity. Stated differently, positive cultures are very predictive and should be scored.

Strength of Recommendation: Strong

Rationale:

Multiple studies have reported the sensitivity and specificity of a positive preoperative aspiration in establishing a diagnosis of PJI. The best study overall is the study by Patel et al that attempts to validate the 2018 ICM criteria. The authors determined that a positive preoperative aspiration was 100% specific 20% sensitive 60% accurate. Additionally, PPT was 59% PPV and NPV was 50%.

Akkaya et al evaluated 50 definite infections as determined by the 2018 ICM criteria. The authors reported 56% concordance of bacterial species between preoperative aspiration cultures and intraoperative cultures at the time of revision. Hutchinson et al evaluated 35 patients prior to revision arthroplasty for an infection as defined by the MIS criteria and determined 80% concordance of bacteria from the aspiration with the bacteria obtained at revision. Additionally, concordance rose to 90% if the preoperative aspiration bacteria were *C. Acnes* and no preoperative antibiotics were given prior to aspiration, with a 100% sensitivity and a 91% PPV.

Zanna et al reported on 50 revision arthroplasties diagnoses as infected using the MIS definition and determined 56% concordance of aspiration cultures with final cultures. If *C. Acnes* was identified on aspiration, there was a higher chance of having concordant cultures. Sensitivity, specificity, PPV and NPV were as follows for the various bacterial organisms: *C. Acnes* 76% sensitive, 72% specific, 73% PPV, 75% NPV; Gram negatives 100% sensitive and specific; MSSA 100% sensitive, 96% specific. Cultures growing out multiple organisms were noted to have lower sensitivities and specificities.

Hecker et al. evaluated native joints, post-fracture repair, post-arthroscopy and post arthroplasty patients and reviewed the correlation between preoperative aspirations and intraoperative cultures in cases of infection. Although the authors identified infection in 24 shoulders only 10 of 24 aspirations yielded positive cultures. The authors determined the sensitivity, specificity, positive predictive value, and negative predictive value of preoperative aspirations were 33%, 98%, 80%, and 83%, respectively.

Lapner et al evaluated 69 patients undergoing revision arthroplasty. Of these 23% were confirmed infected by intraoperative cultures He reported rates of 0% sensitivity; 81% specificity; 0% PPV and 78% NPV in terms of preoperative aspirates to correctly identify infection in this revision cohort.

Dilisio et al reported on a series of patients undergoing arthroscopic biopsy prior to revision arthroplasty who also had preoperative aspirations. The authors determined that aspirations had a sensitivity of 16.7%, specificity of 100%, PPV 100%, and NPV of 58.3% to identify a positive culture at the time of revision arthroplasty.

Pruijn et al reported on 57 patients undergoing aspiration prior to revision shoulder arthroplasty and reported 20% sensitivity, 90.6% specificity, 62.5% PPV and 59.2% NPV for preoperative aspiration to predict positive culture at revision surgery.

Finally, Tat et al performed a systematic review and meta-analysis on the value of aspiration and biopsy in predicting results at revision surgery. A review of the meta-analysis for sensitivity and specificity for all studies combined indicated that arthroscopic tissue cultures (0.76 [95% confidence interval (CI), 0.57-0.88] and 0.91 [95% CI, 0.79-0.97], respectively) were superior to both aspiration (0.15 [95% CI, 0.03-0.48] and 0.93 [95% CI, 0.65-0.99], respectively) and a positive erythrocyte sedimentation rate or C-reactive protein level (0.14 [95% CI, 0.02-0.62] and 0.83 [95% CI, 0.56-0.95], respectively) in diagnosing periprosthetic shoulder infections. Nevertheless, the specificity of aspiration was still 93% despite the low sensitivity.

Despite the different research methodologies all the studies summarized above revealed specificities between 72-100% for joint aspiration and culture. The low false-positive rates underscore the usefulness of joint aspiration and culture in the diagnosis of shoulder PJI.

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