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QUESTION 1: Is there a role for preoperative joint aspiration in the evaluation of the painful elbow arthroplasty for periprosthetic joint infection (PJI)?

RECOMMENDATION: Preoperative joint aspiration can play a role in the evaluation of the painful total elbow arthroplasty (TEA) suspected for infection.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 100%, Disagree: 0%, Abstain: 0% (Unanimous, Strongest Consensus)

RATIONALE

In a patient with painful TEA and the presence of prosthetic loosening on the radiographs, PJI is high on the list of differential diagnosis. PJI remains one of the major failure modes for TEA. Joint aspiration has not been evaluated at length as a diagnostic test in TEA, with only a few studies examining its role and usefulness in the identification of infection of the joint [1–3]. Although joint aspiration has not been specifically evaluated as a diagnostic test in TEA, the value of this diagnostic approach has been proven in the workup of patients with hip and knee arthroplasty [4].

Gille et al. reported that in five of six infected elbows, positive joint aspiration cultures were found, and cultures of the sixth elbow, which had previously been treated with antibiotics, tested positive for infection at the time of revision [2]. There is little data on the role of joint aspiration in evaluating infection in TEA, however, it has been shown to be useful in identifying patients with PJI in hip and knee arthroplasty patients [4].

When aspirated, the obtained synovial fluid should be sent for white blood cell (WBC) count, with particular attention to the differential (% polymorphonuclear neutrophils). In addition, the fluid should be sent for aerobic and anaerobic cultures. Elevated synovial fluid WBC count is highly suggestive of PJI [5]. The hip and knee arthroplasty literature demonstrated excellent sensitivity and specificity of synovial WBC for the diagnosis of chronic PJI [6–11]. Based on that literature, the proceedings of the International Consensus on PJI recommends the following thresholds for synovial fluid tests for chronic PJI: WBC > 3,000 cell/microL and % PMN of 80% [12]. For acute PJI, the recommended thresholds are the following: WBC > 10,000 cell/microL and % PMN of 90% [12].

Gram stains lack sensitivity and specificity, and are not routinely recommended [13]. Cultures remain the most effective method for specific organism identification. However, despite a high specificity, culture has poor sensitivity and a negative culture does not rule out the diagnosis of PJI [14–18]. For isolation of the infecting organism, aerobic and anaerobic cultures of the obtained samples should be performed [19,20]. The addition of Acid-Fast Bacilli (AFB) and fungal cultures can also be considered in patients with atypical infection and a possibility for these infections. Additionally, incubating cultures for a longer period (21 days) may assist in identifying fastidious, slow-growing organisms such as *Cutibacterium acnes* [21].

Despite the lack of adequate studies in the TEA literature, and borrowing from the hip and knee arthroplasty, we recommend that

aspiration of elbow joint suspected of infection should be part of the diagnostic work up. The synovial fluid obtained should be sent for routine culture (which may need to be kept for 14–21 days), WBC count, determination of neutrophil percentage and possibly molecular analyses for identification of the infective organisms.

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QUESTION 2: What is the role for serum erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) or white blood cell (WBC) count in the evaluation of an elbow arthroplasty for periprosthetic joint infection (PJI)?

RECOMMENDATION: ESR, CRP and WBC play a role in screening and monitoring for PJI, though evidence is limited regarding specific thresholds and strategies to guide the surgeon when interpreting these values.

LEVEL OF EVIDENCE: Consensus

DELEGATE VOTE: Agree: 95%, Disagree: 0%, Abstain: 5% (Unanimous, Strongest Consensus)

RATIONALE

When in the evaluation stage of a suspected PJI, these laboratory markers are often combined with the clinical findings and joint aspiration to increase confidence of PJI [1-9]. In isolation, ESR and CRP may be difficult to interpret, especially in the setting of a medically complex patient with underlying conditions such as rheumatoid arthritis or with atypical infectious organisms such as fungi [2,3]. In monitoring for resolution of an infection after initial explantation, these laboratory markers are utilized again in concert with clinical factors, and it is important to trend these over time [5]. If the values have not normalized at the time of subsequent surgery with plans to reimplant, a repeat debridement and washout is advised along with the trending of values over time.

Despite the lack of multiple randomized clinical trials reflecting the utility of ESR, CRP and WBC measurement and monitoring in the patient with PJI of the elbow, several retrospective studies demonstrate the usefulness of integrating these values into the treatment plan. Also, the importance of these markers has been incorporated into the recommendations of the American Academy of Orthopaedic Surgeons for the treatment of PJI in the hip and knee [7,10]. This recommendation is rated as “limited” due to the lack of large, high-quality studies addressing PJI in the elbow specifically, rather than adapting already-published data from other joints, though these results are useful as they may be extrapolated to the management of elbow PJI.

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