incomplete as a treatment modality for chronic elbow PJI [11]. One aspect that should be taken into account is the technique used during arthrodesis, as Sala et al. found this influences the functional outcome following elbow PJI [19]. Overall, due to the limited literature, we cannot recommend the use of elbow arthrodesis to treat chronic elbow PJI.

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QUESTION 6: Should all foreign material (including cement) be removed during resection arthroplasty of an infected elbow?

RECOMMENDATION: When treating elbow periprosthetic joint infection (PJI), attempts should be made to remove all foreign material. However, the benefit of removing all foreign material should be weighed against the effort to preserve bone stock.

LEVEL OF EVIDENCE: Limited

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

RATIONALE

Surgical management of an infected total elbow arthroplasty (TEA) is dependent on the chronicity of the infection and the infecting organism, as well as host factors. The majority of TEA components are placed in a cemented fashion. In cases where the humeral and ulnar components are removed, the cement mantle may or may not be easily extractable at the time of surgery. This discussion will focus on the literature which reports on patient outcomes following TEA component resection with retained foreign material.

A systematic review was performed using the search terms, "retained cement AND total elbow arthroplasty NOT shoulder." This search yielded zero results. Therefore, a broader search criterion was utilized. The second search evaluated "total elbow arthroplasty AND infection AND removal NOT shoulder." All 32 articles were reviewed. Of these, only one paper documented retained cement in the setting of removal of the humeral and ulnar components. Stoodley et al. [1] reported a single case series of a TEA performed for a distal humerus fracture nonunion. The patient underwent multiple staged operations including before and after the index TEA. Cultures remained negative until the seventh operation, when the authors noted a positive culture and documented that retained cement was removed at that time. However, the authors were unable to state if the retained cement was the cause of persistent infection, as the patient had not previously received targeted antibiotics that effectively addressed the infectious antimicrobial profile.

Given the lack of evidence available within the total elbow arthroplasty literature, information regarding the effect of retained cement must be taken from other orthopaedic literature. Early reports in the lower extremity arthroplasty literature raised concern about the correlation of retained cement and incomplete eradication of infection [2]. However, not all series have correlated retained cement with persistence of infection [3,4]. Petty et al. reported on 54 total hips treated for PJI. At the time of revision surgery, the presence of retained cement was not associated with positive intraoperative cultures.

Given the lack of data available in the elbow arthroplasty literature, we are unable to make a recommendation regarding the necessity to remove all cement or other foreign material in the treatment of periprosthetic TEA infections.

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QUESTION 7: Is there a role for chronic antibiotic suppression in the management of elbow periprosthetic joint infection (PJI)?

RECOMMENDATION: Long-term suppressive antibiotics may be used in the treatment of PJI of the elbow. Consultation with an infectious disease specialist should be considered in the decision to use long-term suppressive antibiotics.

LEVEL OF EVIDENCE: Consensus

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

RATIONALE

Treatment strategies for elbow PJI have generally taken four forms; irrigation and debridement with component retention, one-stage exchange arthroplasty, two-stage exchange arthroplasty and resection arthroplasty. Each of these treatment options may be followed by the use of suppressive antibiotics [1].

A systematic review was performed using the terms "elbow arthroplasty AND chronic suppressive antibiotics." This revealed zero results. A second search using the terms "infected elbow replacement AND suppressive antibiotics" produced no results. A third search using the terms "infected elbow AND chronic suppressive antibiotics" produced zero results.

A fourth search using the terms "chronic suppressive antibiotics AND elbow infection" produced a single result: "Gram-Negative Prosthetic Joint Infection: Outcome of a Debridement, Antibiotics and Implant Retention Approach. A Large Multicentre Study" [1]. In this multi-center study from Spain, there were two elbow PJIs out of 242 PJIs managed with debridement and chronic suppressive antibiotics (the other 240 patients included 150 hip, 85 knee and 5 shoulder). They reported 79% successful outcomes. Ciprofloxin exhibited a protective effect and chronic renal impairment predicted failure.

A final search with the terms "chronic suppressive antibiotics AND total joint infection" produced 12 results. Only one study (the previously-cited Rodriguez-Pardo article) included elbow replacement patients. Given the lack of evidence specific to PJI of the elbow, the only evidence available is contained in articles related to PJI of other joints. Aboltins et al. published a review citing a 77% success rate using rifampin-based therapy [2]. These two articles provide the most recent evidence in the use of antibiotic suppression in the treatment of PJI of the elbow. There are several other articles, primarily on hip and knee, and two are referenced that provide further evidence in support of suppressive antibiotic therapy [3,4].

In the absence of concrete data and given the complexity of removing well-fixed cemented components of total elbow arthroplasty, we believe suppressive antibiotic therapy may have more of an expanded role in these patients than in PJI affecting other joints.

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