

SH10: Are markers of poor nutrition associated with PJI (Vitamin D, albumin, prealbumin, transferrin, etc)

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Answer / Recommendation: The available literature demonstrates an association between malnutrition and periprosthetic shoulder infection. However, there is little guidance on specific markers of malnutrition that may be utilized or how to mitigate prosthetic shoulder infection in malnourished patients.

Strength of Recommendation: Limited

Rationale: A comprehensive literature review was performed to identify all studies on markers of poor nutrition associated with PJI. Searches for the terms “shoulder replacement”, “infection”, “nutrition”, “postoperative” and “joint replacement” were performed using the search engines PubMed and Google Scholar which were searched through February 2018. Inclusion criteria for our systematic review were all English studies (Level I-IV evidence) that reported on nutrition and PJI, or lack thereof, in cases of shoulder arthroplasty. Exclusion criteria were non-English language articles, nonhuman studies, retracted papers, case reports, review papers, studies with less than <10 patients in the sample size, studies without clinical follow-up/infection rates, and technique papers without patient data. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) criteria were followed. Thirty articles met inclusion and exclusion criteria and were reviewed.

Adequate nutrition is essential for wound healing, infection prevention, and overall recovery following surgery. In recent years, there has been growing interest in the role of nutrition optimization in enhancing surgical outcomes especially in shoulder arthroplasty and reducing PJI.[1] Preoperative nutritional status has been linked to postoperative complications and outcomes in shoulder surgery and shoulder arthroplasty. Malnutrition is defined as albumin less than 3.5 g/dL, transferrin less 204 mg/dL, total leukocyte count less than 1500 cells/mm³ but few studies have investigated outcomes in shoulder surgery.[2] This is because preoperative nutrition labs are not drawn on every patient which limits the sample size for analysis. There are also no standard indications for obtaining perioperative nutrition labs which introduces selection bias. Studies have demonstrated that preoperative nutritional interventions, such as oral nutritional supplements or dietary counseling, can improve surgical outcomes by reducing the incidence of complications and accelerating recovery. Despite the knowledge of worse outcomes in shoulder arthroplasty in malnourished patients, the prevalence remains high. Garcia et al found that 7.6% of patients are malnourished undergoing shoulder arthroplasty and these patients had higher pulmonary complications, anemia requiring transfusions, length of stay and death within 30 days.[3] Malnutrition has also been associated with an increased risk of periprosthetic shoulder infection. Patients that were malnourished were 2.62 times more likely to have an infection. They also found that malnourished patients had higher cost per day for inpatient stays, skilled nursing facilities and inpatient rehabilitation.[4] Burns et al looked at patients that met criteria for malnutrition and found a \$5850 increase in charges for these patients, mean length of stay of 3.7 days, a \$6971 increase in 90 day charges, and an increased odds ratio of 3.0 for readmission.[5]

Flamant et al conducted a multicenter analysis of patients defined as malnourished with albumin <3.5g/dL. They found that 37% patients requiring a revision were malnourished and 20% of primaries. They found that risk factors for malnutrition in shoulder arthroplasty were reverse shoulder arthroplasty, elevated ASA scores, and liver disease. Malnutrition was associated with a 13% increase in extended length of stay and an 8% increase in discharged to skilled nursing. Llombart et al conducted a meta-analysis looking at the impact of hypoalbuminemia on shoulder arthroplasty complications. They found patients with hypoalbuminemia had higher rates of readmissions, reoperations, increased hospital stay, and cardiovascular events including death.[6] Other studies have found similar findings in patients after primary and revision shoulder arthroplasty patients with hypoalbuminemia[7-10]. Finally, the geriatric malnutrition score to evaluation complications after TSA. The geriatric malnutrition score is calculated by a formula combining albumin levels and ideal versus current weight. The study found that the higher the malnutrition score, the rate of all complications but did not specifically look at PJI.[11]

Patients weight has also been highly correlated with outcomes and malnutrition. Buzney et al found that 7.6% of obese patients had hypoalbuminemia and these patients had longer hospital stays, higher rates of mortality and systemic infections.[12] Other studies have looked at patients who are defined as underweight with a BMI which could be a marker of malnutrition. They found a significantly higher odds of infection and 30 day readmission in patients who were underweight.[13] Hones et al found similar findings and found that patients less than a BMI of 18.5 had a higher rate of complications over every other BMI group.[14] Bariatric surgery also is a marker for malnutrition. Marigi et al examined complications after bariatric surgery and found that complications were increased in these patients but it was independent of body mass index. They found that patients were at highest risk <2 years post bariatric surgery and complication rates were higher than morbidly obese patients.[15]

Other markers of malnutrition have been associated with inferior outcomes. Decreased preoperative bilirubin levels have been associated with infections after shoulder and knee arthroplasty.[16] Other studies have found thrombocytopenia to be associated with higher complication rates, cardiac arrest, and need for transfusions.[17] Other markers of malnutrition like anemia have been associated with implant related complications like periprosthetic fracture, joint infection, mechanical loosening, prosthetic infection, and total complications.[17, 18] Hypovitaminosis D levels have also been analyzed in total shoulder patients and they found that the majority were insufficient or deficient and they recommended optimization of optimization.[19, 20] Other studies have looked at patients with hypovitaminosis D levels and found higher rates of all cause revisions in total shoulders but not PJI.[21] Finally, some studies have found higher rates of infection in patients with hypovitaminosis D in all forms of arthroplasty.[22]

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