SH9: Does the use of pyrocarbon prevent shoulder periprosthetic joint infection?

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Supportive delegates: Scott Paxton, Tyler Brolin

Response: It is currently unknown if pyrocarbon bearing surfaces reduce the risk of shoulder PJI.

Strength of Recommendation: Limited

Delegate Vote: 49 (100%) agree; 0 disagree; 0 abstain

Rationale: A comprehensive literature review was performed to identify all studies on Pyrocarbon use in cases of PJI and if it can be used to prevent PJI after revision shoulder arthroplasty. Searches for the terms "shoulder replacement", "infection", "Pyrocarbon", "postoperative" and "joint replacement" were performed using the search engines PubMed and Google Scholar which were searched through January 2025. Inclusion criteria for our systematic review were all English studies (Level I-IV evidence) that reported on Pyrocarbon implants use in cases of revision shoulder arthroplasty. The search was extended to the whole upper limb. 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. Twelve articles dealing with Pyrocarbon arthroplasty of the upper limb (including wrist and Interphalangeal joints) were reviewed.

The theoretical benefits of Pyrocarbon material, besides its biocompatibility and elasticity [9,11], is resistance to wear, fatigue, and prevention of bacterial adhesion[10]. Pyrocarbon spacer represents a potential salvage option in patients that do not desire a resection arthroplasty and in those where glenoid reconstruction is not feasible due to significant bone loss and erosion. Since Pyrocarbon material is resistant to bacterial adherence, could it be used as a temporary or permanent spacer for treatment of chronic SJI and PJI? Only one case series dealt with this question[1]. None of the studies specifically evaluated their efficacy or included a comparative group. The one published paper[1] suggested that after eradication of shoulder prosthetic joint infection with washout, debridement and antibiotics, Pyrocarbon spacer can be used in select patients, as a temporary or permanent functional spacer, in the treatment of shoulder infections to improve pain, and restore shoulder motion. In this series of 15 patients operated for chronic PJI and SJI, no recurrence of infection was observed after temporary (3 cases) or definitive (12 cases) pyrocarbon spacer implantation. According to this study, the benefit of Pyrocarbon spacer is threefold: (1) the pyrocarbon material prevents adhesion of bacterial pathogens and does not seem to be a risk for recurrent infection compared to implanting a metal, (2) the Pyrocarbon implant acts as a "functional spacer" that mitigates some of the pain associated with cement spacers and restores acceptable shoulder function for activities of daily living, and (3) in case where prothesis reimplantation is technically infeasible because of significant bone loss and in patients who refuse a resection arthroplasty, pyrocarbon represents a potential salvage option. The sphericity of the implant prevents the need of implant anchorage and provides acceptable shoulder motion for ADLs.

A potential disadvantage of pyrocarbon is the absence of elution of antibiotics inside the shoulder joint, which allows for local delivery of antibiotics. This is the main advantage of antibiotic cement spacer, although the amount of antibiotic elution is unknown and remains limited in time and concentration. In aggregate, there is very limited Strength of Recommendation as only one study[1] suggests that after eradication of shoulder joint infection with washout, debridement and antibiotics, Pyrocarbon spacer can be used in select patients, as a temporary or permanent functional spacer, in the treatment of shoulder infections to improve pain, and restore shoulder motion.

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