SH6: How does surgical time influence the risk of Shoulder PJI?

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Response: Unknown. There may be an association between surgical time and subsequent shoulder PJI.

Strength of Recommendation: Limited

Delegate Vote: 48 (94%) agree; 1 (2%) disagree; 2 (4%) abstain

Rationale: The search strategy was created to capture the concepts representing prosthesis-related or surgical site infection, shoulder surgery, and operative time or length of procedure. Indexing terms and keywords were used for all terms, and truncation and adjacency operators were utilized to retrieve all potentially relevant articles. No language or year filters were imposed on the search. The following databases were searched on December 2, 2024: Ovid Medline ALL®, Ovid Embase, Cochrane Central Register of Controlled Trials and Web of Science from Clarivate (Core Collection and BIOSIS Citation Index. A total of 644 citations were uploaded into Covidence and 151 duplicates were removed by the software and 3 manually. After two reviewers (J.H. and J.L.) screened for relevance, 28 full-text studies were assessed for eligibility by applying the inclusion and exclusion criteria, leaving 20 for final inclusion in the discussion and review. Eight were relevant to this topic and included into final report.

Surgical or operative time has been suggested to be a factor in postoperative infections. Hip and Knee arthroplasty has looked at this as factor in multiple studies, and in the shoulder, there have been studies on arthroscopic rotator cuff repair that suggest increased risk of surgical site infections with each 15 minutes of surgical time (Agarwalla). Regarding the relationship of surgical site infections to shoulder arthroplasty specifically, one study (Schmitt) has asked this question specifically about SSI, and they found SSI was associated with operative time in a multivariable model, and 180 minutes as an inflection point that associated operative time with increased SSI. Other studies have alluded to operative time being associated with increased risk of PJI in the shoulder, but with the primary question being with other covariates. One study used the ACS-NSQIP database to study primary vs. revision TSA, and showed revision TSA was associated with more wound infections and also longer operative time but did not complete a multivariate analysis including both covariates (Boddapati). Another ACS-NSQIP database study looking at a machine learning model to predict short-term postoperative outcomes attempted to create a model for SSI, but it was not significant with the inputs they used, although length of surgery was the 3rd most important covariate of the model (Gowd). Another ACS-NSQIP study analyzed male/female SSI differences and found males had more SSI and longer operative time, but did not include a multivariate analysis of both sex and operative time (Knapp).

Other studies used the ACS-NSQIP database to find associations with all complications and found that operative time >120min was associated with all complications, but not with SSI (Swindell). Wilson et al also queried the ACS-NSQIP database and found SSI correlated with operative time in a bivariate model, but when included in a multivariate model, it no longer was significant (Wilson).

The only non ACS-NSQIP study is an abstract from a national meeting (ASES 2016). This studied the Kaiser-Permanente database and included 8,056 primary arthroplasties from 2005-14. The authors found operative time >150 minutes was associated with increased infection risk (HR 1.68 CI 1.01-2.80). Longer operative time was associated with lower surgeon and hospital volume, male gender, younger patients

(<60 years of age), and diagnosis of failed instability, failed fracture fixation, malunion and nonunion. Unfortunately, these results were never published in the peer reviewed literature (Yian).

In conclusion, the available literature is mostly based on the ACS-NSQIP database, which is an short-term outcomes database with the inherent shortcomings of such data usage. In addition, many of these articles may have used the same subjects as they were querying the same database. Surgical Site Infection was the coded term used as their outcome measure or covariate of interest and is used as an "alternative" to prosthetic joint infection in these studies - as these studies are unable to truly diagnose PJI with the available data sets. Although some studies have found a correlation (univariate and multivariate) of operative time with SSI, others did not. Some of this appears to be varying selectivity of covariates in a multivariate model, as some studies that did find significance used a multivariate model, while others did not. Also, many of these models did not all include the same covariates and thus could alter the final stability and significance of the model. Issues with collinearity, model construction and stability are all of methodological concern, and thus a final conclusion is unclear on the relationship of operative time with surgical site infection in shoulder arthroplasty.

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