

A Systematic Meta-Analysis of Using an Articulating Spacer Technique in Revision Total Knee Arthroplasty

To the Editor:

We read with great interest the recent article by Spivey et al¹ about using an articulating spacer technique in revision total knee arthroplasty complicated by sepsis. The authors focused on which kind of spacer produced increased interim range of motion, adequate infection eradication rates, low spacer fracture rates, and decreased spacer-related complications. They performed a systematic review of the literature and identified 34 studies (1016 spacers). They compared 4 types of articulating spacers and found that there was an increase in interim range of motion, fewer spacer-specific complications, and no spacer fracture for metal-on-polyethylene spacers. No statistical differences regarding reinfection rates and difficulty of reimplantation were observed among the 4 types of articulating spacers. The conclusion of this study is valuable and instructive for clinical practice. However, we have several issues that we would like the authors to address.

First, although the authors mention the variety of databases they used in their study, they do not provide detailed information regarding the search strategy. It would have been better if the authors had reported the search strategy and retrieval details. Furthermore, manual searches should have been stated in this meta-analysis. There would be a lack of literature if the manual search protocol was incomplete. Unpublished grey data should have been included.

Second, a sensitivity analysis was not performed. Publication bias should have been considered, demanding assessments by funnel plots, Begg's test, and Egger's test.

Third, the authors concluded that the interim range of motion of metal-on-polyethylene spacers was superior to that of the other spacers. Nevertheless, other key factors may influence outcomes. As reported by Affatato,² the most important factors in total knee arthroplasty and revision are surgical technique, surgeon experience, and postoperative rehabilitation program. Different surgical techniques and different postoperative rehabilitation programs may yield different results.

Finally, we agree with the authors' conclusion that the Knee Society Score may not be specific enough to detect some important factors that may contribute to patients' satisfaction. Ghanem et al³ reported the existing limitations of the Knee

Society Score in evaluating outcomes following revision total knee arthroplasty. Ideally, for the sake of elucidating patient characteristics, assessment scales should be administered for inpatients. This may not be easy or practical, however. It would be better if further study could lead to the development of a concise, simple standardized questionnaire applicable both before and after revision total knee arthroplasty.

Hanchong Zhang, PhD
Tao Xiao, PhD
Changsha, China

The authors have no relevant financial relationships to disclose.

REFERENCES

1. Spivey JC, Guild GN III, Scuderi GR. Use of articulating spacer technique in revision total knee arthroplasty complicated by sepsis: a systematic meta-analysis. *Orthopedics*. 2017; 40(4):212-220. doi: 10.3928/01477447-20170208-06
2. Affatato S, ed. *Surgical Techniques in Total Knee Arthroplasty (TKA) and Alternative Procedures*. Cambridge, United Kingdom: Elsevier; 2014.
3. Ghanem E, Pawasarat I, Lindsay A, et al. Limitations of the Knee Society Score in evaluating outcomes following revision total knee arthroplasty. *J Bone Joint Surg Am*. 2010; 92(14):2445-2451.

Reply:

Regarding their first point, Drs Zhang and Xiao suggest that we did not provide detailed information regarding our search strategy.¹ They say that it would have been "better" if we had reported our search strategy and retrieval details. However, we clearly delineated our search strategy and retrieval details in the section of our article entitled "Search Strategy" under the heading "Materials and Methods." We refer Drs Zhang and Xiao to the 2 full paragraphs on page 213 devoted to this information. Furthermore, the search strategy and reporting are in agreement with best practices in reporting for systematic reviews.²⁻⁴ We state in the article that manual searches were used in reviewing each identified article's references to identify additional studies. In addition, the exhaustive search of the literature was performed with the assistance of an experienced university medical librarian. Reference lists of all included studies were scanned to identify additional relevant studies. Grey data were not included in the systematic review because the topic of articulating spacer construct is not subject to publication lag. Grey literature is more applicable to health technology assessments, economic evaluations, and health system impact assessments.

Regarding their second point, Drs Zhang and Xiao suggest that a sensitivity analysis should have been performed. We disagree with this suggestion. The studies used for systematic review in our article had minimal bias. Our article itself had a low risk for publication bias because there was no financial incentive. Furthermore, sensitivity analyses involving funnel plots, Begg's test, and Egger's test have reduced statistical power and are based on strong and unverifiable assumptions. They do not guarantee the validity of conclusions.^{5,6}

Regarding their third point, Drs Zhang and Xiao suggest that surgical technique, surgeon experience, and postoperative rehabilitation programs are the most important tenants of postoperative motion in knee replacement. Although surgical technique and surgeon experience can affect postoperative motion, a more cogent argument against the superior interim range of motion of metal-on-polyethylene spacers would have been the preoperative motion of the knees in the 4 groups. Traditionally, preoperative motion has been the most consistent factor dictating postoperative motion in knee replacement.⁷ We refer Drs Zhang and Xiao to the middle column on page 218 of our article where we thoroughly address this.

In summary, we reiterate that our article reports the results of the first analysis to offer insight into several important, clinically relevant issues regarding the superiority of one articulating spacer technique over another. Our review revealed several findings, including the potential for increased interim range of motion, noninferior infection eradication rates, and avoidance of spacer fracture, compared with cement-on-cement spacers, for metal-on-polyethylene spacers.

John C. Spivey, MD
George N. Guild III, MD
Atlanta, Georgia
Giles R. Scuderi, MD
New York, New York

Drs Spivey and Guild have no relevant financial relationships to disclose. Dr Scuderi is a paid consultant for Zimmer, Medtronic, and Convatec.

REFERENCES

1. Spivey JC, Guild GN III, Scuderi GR. Use of articulating spacer technique in revision total knee arthroplasty complicated by sepsis: a systematic meta-analysis. *Orthopedics*. 2017; 40(4):212-220. doi:10.3928/01477447-20170208-06
2. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med*. 2009; 6(7):e1000097.
3. Moher D. CONSORT: an evolving tool to help improve the quality of reports of randomized controlled trials. Consolidated Standards of Reporting Trials. *JAMA*. 1998; 279(18):1489-1491.
4. von Elm E, Altman DG, Egger M, et al; STROBE Initiative. The Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet*. 2007; 370(9596):1453-1457.
5. Duval S, Tweedie R. Trim and fill: a simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics*. 2000; 56(2):455-463.
6. Sutton AJ, Song F, Gilbody SM, Abrams KR. Modelling publication bias in meta-analysis: a review. *Stat Methods Med Res*. 2000; 9(5):421-445.
7. Ritter MA, Harty LD, Davis KE, Meding JB, Berend ME. Predicting range of motion after total knee arthroplasty: clustering, log-linear regression, and regression tree analysis. *J Bone Joint Surg Am*. 2003; 85(7):1278-1285.

doi: 10.3928/01477447-20171019-01