Why Articulating Spacers should Not Be Considered Superior to Static Spacers, despite Achieving Superior Outcomes after Two-Stage Revision for Periprosthetic Joint Infection?

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INTRODUCTION:
Periprosthetic joint infection (PJI) is one of the most devastating complications after total joint replacement. The “gold standard” treatment is still considered a two-stage approach with implantation of spacer for the interim period. The goal of this study is to 1) reveal the current treatment approach and outcomes after two-stage revision at our university center, 2) compare preoperative patient characteristics between patients from the articulating and static cohort, and 3) try to identify objective parameters to guide the individual decision whether a static or an articulating knee spacer should be used.
METHODS:
Between 2017 and 2020, 80 consecutive patients were enrolled in a two-stage approach for PJI of the knee with implantation of either an articulating (n=35) or a static spacer (n=45). The decision whether to use an articulating or a static spacer was made individually during first-stage surgery. Otherwise, the treatment regimen and postoperative care were identical in both groups. We retrospectively compared preoperative patient characteristics, spacer-related complications, reimplantation rates and infection free survival rates between both spacer groups. Furthermore, we prospectively collected patient-reported outcome measurements (PROMs) for both spacer groups at four different points in time: T1=before diagnosis of PJI, T2=prior to spacer implantation, T3=with spacer, and T4=after reimplantation of new prosthesis.
RESULTS:
Comparison of preoperative patient characteristics between both spacer groups revealed statistically significant differences for history of PJI of the same joint (positive vs. negative history of PJI; $p < 0.001$), type of the infected implant (revision implant vs. standard implant; $p < 0.001$), for the extent of bone loss assessed during first-stage surgery (AORI I/IIa vs. AORI IIB/III; $p < 0.001$), for the identified causative germs (difficult-to-treat vs. non-difficult-to-treat; $p < 0.038$), and for the periarticular soft-tissue condition (fistula vs. no fistula; $p < 0.033$). Patient demographics, including patient age, sex, or comorbidity (assessed with the ASA-score) showed no significant differences between both groups.
During the spacer-period 1 (1%) spacer-related mechanical complication, a fracture of a static spacer had occurred and at least one additional round of spacer exchange was performed in 4 (5%) patients with a static spacer because of assumed persistence of infection. A total of 7 (9%) patients (1 articulating and 6 static spacers) did not proceed to reimplantation because of either persistent infection or medical reasons in combination with patient preference.
A minimal follow up of two years after reimplantation revealed an overall reinfection rate of 16%, with 12.5% (n=4) for the articulating and 19% (n=7) for the static spacer group. The overall two-year mortality rate was 17.5% (n=14).
We did not identify any statistically significant preoperative differences for joint function (WOMAC) or activity level (UCLA) between both groups. But patients with an articulating spacer achieved significantly superior results during the spacer period and after reimplantation (mod. WOMAC: articulating 70 ± 18 vs. static 49 ± 23; $p < 0.001$).
DISCUSSION AND CONCLUSION:
With a reinfection rate of 16% and a two-year mortality rate of 17.5%, PJIs remain a great challenge even in specialized centers. Both static and articulating spacers demonstrated a similarly high level of safety, characterized by a low occurrence of mechanical complications. Patients treated with an articulating spacer were less likely to undergo an additional round of spacer exchange, had a higher probability to proceed to reimplantation, and demonstrated a lower rate of reinfection. Furthermore, patients treated with an articulating spacer achieved a superior joint function and activity level during the spacer period and after reimplantation. But making such a direct comparison of outcomes between the two spacer groups fails to acknowledge the significantly more demanding initial situation in which static spacers were used. The comparison of preoperative patient characteristics revealed statistically and clinically significant differences between patients from the two spacer groups. Patients with a positive history of a PJI of the same joint, infection of a revision implant, extensive bone loss, bad periarticular soft tissues, and identified difficult-to-treat pathogens are significantly more likely to be treated with a static spacer. Therefore, static and articulating spacers should be used in conjunction to prevent complications and achieve the best possible outcomes. Whenever feasible, clinicians should prioritize the use of articulating spacers but when in doubt switch to a static spacer. The previously mentioned preoperative parameters can be used as a guidance when deciding which type of spacer to utilize.