

Patient-specific Flanged Acetabular Component Failure is Associated with Excess Lateral Position Relative to Planned Position and Excess Cranial Position Relative to Anatomic Hip Center

Daniel Alexander Driscoll, Troy Bornes, Delano R Trenchfield, Peter Hyung Jin Sun, Joseph D Lipman, Timothy M Wright, Mathias P G Bostrom, Peter Keyes Sculco

INTRODUCTION: Patient-specific flanged acetabular components (FACs) are patient-specific implants used in complex acetabular revision. Although FACs are designed to be placed in a specific position, accurate placement can be challenging. It is currently unknown whether placement accuracy of FACs impacts aseptic loosening and survivorship. This study aimed to 1) evaluate accuracy of FAC placement relative to (a) planned position and (b) anatomic hip center (AHC), and 2) determine whether placement accuracy is associated with radiographic component failure or re-revision.

METHODS: This retrospective study reviewed 99 FAC procedures performed in 94 patients (mean age 62, range 37-82 years) from 2004-2017. Postoperative radiographs were used to compare the distance between actual postoperative final FAC position and the preoperatively planned position (Figure 1). Implant distance from AHC (as defined by Fujii modification of Ranawat hip center) was also measured (Figure 2). Aseptic failure was defined as radiographic failure or revision involving FAC removal for aseptic loosening.

RESULTS: At a mean follow-up of 11.7 years, 16 cases (16.2%) underwent a subsequent re-revision; an additional 8 cases (8.1%) developed loosening on radiographic evaluation. Patients with maintained FACs were older than patients with revised or radiographically loose FACs ($P < 0.001$; Table 1). Overall distance between the actual and planned positions was $< 5\text{mm}$ in 34 cases (40.0%; Figure 3). Mean distance from planned position was 7.1mm (0.4-34.7) and from AHC was 18.5mm (2.8-65.8; $P < 0.0001$; Table 2; Figure 4). Revised FACs were placed more laterally to planned position compared to implants (5.7mm lateral vs. 3.0mm lateral; $P = 0.04$; Table 3). Implants $> 7\text{mm}$ lateral to plan were more likely to undergo FAC revision (57.1% vs. 11.3%; $P = 0.004$). Failed FACs were placed more cranially relative to AHC than non-failed FACs (13.0mm cranial vs. 7.3mm cranial; $P = 0.048$; Table 4).

DISCUSSION AND CONCLUSION: Patient-specific FACs were placed $> 5\text{mm}$ from planned position in 60% of cases. Excess lateral placement relative to plan was associated with re-revision. Excess proximal position relative to AHC was also associated with failure. Surgeons should aim for accurate FAC placement relative to plan and attempt to restore alignment with anatomic hip center, especially in the craniocaudal axis.

