

Lateralization of Custom Flanged Acetabular Component does not Negatively Impact Implant Survivorship

Andrew J. Hughes^a, Daniel A. Driscoll^a, Haena-Young Lee^b, Joseph D. Lipman^b, Timothy M. Wright^b, Mathias P. Bostrom^a, Peter K. Sculco^a

^a Stavros Niarchos Foundation Complex Joint Reconstruction Center, Adult Reconstruction and Joint Replacement Service, Department of Orthopedic Surgery, Hospital for Special Surgery, 535 E 70th St, New York NY 10021

^b Department of Biomechanics, Hospital for Special Surgery, 535 E 70th St, New York NY 10021

Background: Custom flanged acetabular components (CFACs) are patient-specific three-dimensional printed implants used in complex acetabular revision. Accurate restoration of hip center is challenging during CFAC implantation due factors associated with bone loss, surgical exposure, and screw position. It is currently unknown whether placement accuracy of CFACs impacts aseptic loosening rates and implant survivorship. The objectives of this study were to 1) determine the accuracy of CFAC placement relative to the preoperatively planned position, 2) evaluate postoperative CFAC hip center compared to the native hip center, and 3) determine whether accuracy of CFAC placement was associated with component failure.

Methods: A retrospective single-center review was performed. Postoperative radiographs were used to measure distances between postoperative CFAC hip center positions and the positions proposed during preoperative planning for 96 acetabular revisions (Fig. 1). The Ranawat hip center (RHC) calculation was used to assess the degree of CFAC position deviation from the native hip center (Fig. 2). Aseptic failure was identified as either CFAC revision or radiographic evidence of component loosening. Distance metrics were compared between the failed and well-fixed CFACs to determine if distance of the final construct from the planned position or native hip center was associated with mid-term outcomes.

Results: The 96 acetabular revisions using a CFAC occurred within a cohort of 91 patients, with a mean age of 62.4 ± 12.5 years and mean follow up of 5 years. Twenty-one radiographic failures were identified with 13 cases undergoing re-revision. Relative to the pre-operative plan, CFAC hip center position deviated by 7.7 ± 4.9 mm for cases that required re-revision and 7.2 ± 4.3 mm with radiographic evidence of failure, neither of which were significantly different from those that were deemed well-fixed, with 7.0 ± 5.8 mm of deviation ($p = 0.68$ and 0.88 , respectively). Relative to the RHC calculation, CFAC hip center position deviated by 22.0 ± 8.0 mm for the revised cases, 23.0 ± 9.0 mm for those with radiographic evidence of failure, and 21.0 ± 10.1 mm for well-fixed implants, none of which were statistically significant ($p = 0.57$ and 0.39 , respectively).

Conclusions: In this retrospective evaluation of 96 acetabular revisions, CFAC malpositioning was not associated with an increased risk of component failure when utilizing either the planned hip center or Ranawat's native hip center calculation. At mid-term follow-up, lateral malposition of modern CFAC components does not affect survivorship.