

Comparison of Revision Rates between Cones versus Sleeves in Revision Total Knee Arthroplasty

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INTRODUCTION: Metaphyseal bone loss is a notable challenge during revision total knee arthroplasty (rTKA). Current treatment strategies include using metaphyseal cones or sleeves. Although these implants serve similar purposes, differences in design, technique, and fixation exist which may affect outcomes. The purpose of this study was to compare all-cause revision rates between patients undergoing rTKA utilizing either a metaphyseal cone or sleeve.

METHODS: Retrospective review was completed for all rTKA cases which utilized a metaphyseal cone or sleeve at a single institution from 1/2004 to 12/2020. Patient demographics, comorbidities, revision rates, reoperation rates, and infection rates were collected and compared between all cones and sleeves using Student's t-test and Chi-square test with alpha = 0.05. Additionally, cementation status was compared among cone and sleeve cases and classified from available operative reports and imaging into four categories: Fully cemented, hybrid fixation, non-cemented, and combination. Hybrid fixation was defined as cementation of the stem into the cone or sleeve without cementation of the distal stem. Combination status denoted rTKA cases where both femoral or tibial cones/sleeves were utilized, with different cement fixation strategies used for the individual femoral and tibial implants.

RESULTS: A total of 5,299 rTKA cases were reviewed, with 128 cone and 517 sleeve rTKA cases identified. No differences in demographics including age, BMI, history of diabetes, smoking, or Elixhauser score were noted between the cone and sleeve groups. After initial rTKA, no differences between groups in all-cause revision rate (cones – 14.0%, sleeves – 15.5%) and all-cause reoperation rate (cones – 16.3%, sleeves – 14.1%) were observed. Sleeve cases had a higher rate of revision for infection (cones – 3.9%, sleeves – 7.5%), although this was not significant ($p = 0.14$). Rates of multiple (2+) additional revisions were also similar (cones – 3.9%, sleeves – 3.7%) between the two groups. No significant differences were found in all-cause revision rate for cementation status among cones (42.5% fully cemented, 56.7% hybrid, 0.8% combination) or among sleeves (3.9% fully cemented, 83.7% hybrid, 4.1% non-cemented, 8.3% combination). However, within the sleeves group, additional reoperation rate was significantly higher ($p = 0.034$) among the fully cemented (27.8%) and combination (25.6%) groups compared to the hybrid (12.4%) and uncemented (14.3%) groups. Revision for infection also approached statistical significance ($p = 0.052$) in the sleeves group and was higher in the fully cemented (16.7%) and combination (16.3%) groups compared to the hybrid (6.5%) and uncemented (4.8%) groups.

DISCUSSION AND CONCLUSION: Our study compared differences between rTKA using cone versus sleeve implants for metaphyseal bone loss. No differences in demographics, comorbidities, and all-cause revision or reoperation rates were found. We also did not find any significant differences in revision rate, all-cause reoperation rate, or revision for infection rate. Within the sleeves group, we found that some differences in risk of reoperation and revision for infection may exist based on cementation status, although this is likely confounded by other factors such as higher risk hosts requiring full cementation or combination fixation strategies. Overall, despite some differences in fixation method and design, cones and sleeves are both suitable options for treating metaphyseal bone loss with comparable risk of revision or infection. Further studies should investigate how these implants fail and whether patient factors, certain patterns of metaphyseal bone loss, and fixation type are contributory.