

Equivalent Risk of Periprosthetic Ankle Fracture with Mobile-bearing and Fixed-bearing Implants: a Systematic Review and Meta-analysis

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INTRODUCTION:

The number of primary total ankle arthroplasty (TAA) procedures performed annually within the United States continues to rise. In recent years, there has been success mitigating postoperative complications through improved implant design. Numerous prospective and retrospective studies have compared mobile-bearing and fixed-bearing implants, with few differences between the two designs. Some studies have described an increased risk of polyethylene liner subluxation with mobile-bearing implant designs, while others have noted increased tibial and talar component loosening with fixed-bearing implant systems. There is a paucity of literature comparing the rates of periprosthetic ankle fracture (PAF) after TAA based on mobile- versus fixed-bearing design. The purpose of this analysis was to compare the PAF rates of mobile-bearing and fixed-bearing total ankle implants.

METHODS:

This review queried the Embase, MEDLINE, CINAHL, and CENTRAL databases from inception until March 2024, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Articles that discussed primary ankle arthroplasty and postoperative complications were included. Those that did not address the presence or absence of a periprosthetic fracture and case reports, previous systematic reviews or meta-analyses, non-English articles, revision TAR articles, and abstracts were excluded. Data extraction was performed by two independent readers, and implant-related information and complication rates were the primary metrics of interest. Finally, data-analysis was performed to compare the relative rates of ankle fracture for mobile-bearing and fixed-bearing systems. Comparison of rates was performed using a two-proportion z-test, with p-values less than 0.05 being considered statistically significant.

RESULTS:

Out of the initially retrieved 489 articles, 23 studies met the inclusion criteria. A total of 1,106 and 2,319 cases comprised the fixed-bearing and mobile-bearing groups with average follow-up durations of 37.3 and 54.1 months, respectively. PAF rates did not significantly differ, with rates of 2.89% for both groups ($p = 0.99$). The fixed-bearing group demonstrated significantly lower rates of revision ($p < 0.01$), hardware failure ($p < 0.01$), and malalignment ($p = 0.02$). There were no differences in the rates of infection ($p = 0.94$) and aseptic loosening ($p = 0.40$). These results should be interpreted with caution as data only came from articles that reported on the presence or absence of PAF.

DISCUSSION AND CONCLUSION:

This analysis of over 3,400 patients represents the current literature on PAF rates seen with mobile-bearing and fixed-bearing TAA implants. Both systems demonstrated low fracture rates with no significant difference between the groups. These findings suggest that the bearing system should not affect the postoperative fracture risk assessment, though there may be differences in other postoperative complications. Future research is needed to fully understand other complication rates, long-term survivorship, and functional outcomes.

	Fixed	Mobile	p-value
Total n	1106	2319	
Periprosthetic Fracture n (%)	32 (2.89%)	67 (2.89%)	$p = 0.99$
Revision n (%)	58 (5.24%)	271 (11.69%)	$p < 0.001$
Hardware failure n (%)	16 (1.45%)	117 (5.05%)	$p < 0.001$
Infection n (%)	29 (2.62%)	39 (1.68%)	$p = 0.94$
Aseptic loosening n (%)	45 (4.07%)	81 (3.49%)	$p = 0.40$
Malalignment n (%)	4 (0.36%)	28 (1.21%)	$p = 0.02$
Gaiter impingement n (%)	56 (5.06%)	82 (3.54%)	$p < 0.001$

*Denotes statistical significance ($p < 0.05$)