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Variations in tibial tray locking mechanisms influence backside wear rates of polyethylene inserts in total knee arthroplasty: A systematic review

Safa Fassihi
George Washington University, USA

Introduction: Modern total knee arthroplasty (TKA) systems use a variety of locking mechanisms to secure the polyethylene insert to the tibial tray. The most common locking mechanisms include peripheral rim locking and dovetail or tongue-in-groove locking mechanisms. Peripheral rim models have a circumferential raised locking mechanism around the tibial tray, whereas dovetail models have grooves in the tibial tray with corresponding areas in the polyethylene insert. The purpose of this review is to provide an update on the evidence regarding the effect of tibial tray locking mechanisms on backside polyethylene wear.

Methods: A Pubmed/MEDLINE query was performed utilizing keywords pertinent to backside wear rates of tibial tray locking mechanisms in TKA. Twelve articles met inclusion criteria and were used in this review.

Results: Backside wear on crosslinked, ultra-high molecular weight polyethylene inserts was most commonly assessed by scanning electron microscopy and the Hood score. These were used on retrieved polyethylene inserts or on a force-displacement-controlled knee simulator in one study. Data showed that peripheral fit locking mechanisms had slightly decreased backside wear rates when compared to dovetail locking mechanisms. However, one study found that peripheral rim locking with nonpolished trays had the highest amount of backside wear of the locking mechanisms studied. Dovetail mechanism implants showed more abrasive wear than other types. Nonpolished tibial trays had more backside wear than polished trays across all locking mechanism types. These results were found to be similar in both posterior stabilized and cruciate retaining designs.

Conclusions: Peripheral rim locking mechanisms show a slight decrease in the amount of backside wear compared with dovetail locking mechanisms. Additionally, polished trays show a decreased amount of backside wear when compared to nonpolished.

Biography

Safa Fassihi is a US-based physician pursuing a career in orthopedic total joint arthroplasty. His research focuses on newer arthroplasty techniques and how they affect patient outcomes. In this specific analysis, he collaborated with a US board-certified orthopedic surgeon who performs a high volume of both simultaneous and staged bilateral total knee arthroplasty.

scf5071@gmail.com