Performance of a triple tapered medial collared cementless femoral stem used through posterior approach in total hip arthroplasty – A comparative analysis using US Medicare data

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INTRODUCTION: Total hip arthroplasty (THA) is generally performed using one of two surgical approaches: the posterior approach or the direct anterior approach, each with its respective advantages and challenges. This study focuses on the performance of a cementless, medial collared, triple tapered hip stem, henceforth TTS, on posterior approach. The TTS accounts for the largest market share and is associated with the lowest revision rates based on the 2024 AJRR data. Past studies have shown a lower revision rate with TTS; however, these studies have not differentiated patients based on approach. It is hypothesized that most patients treated with TTS in prior studies underwent THA using the anterior approach since TTS was initially designed for anterior approach. However, many posterior surgeons have also adopted the stem in their practice and the evidence for TTS use in posterior approach is limited. This study is specifically designed to evaluate both the clinical and economic outcomes of patients undergoing posterior THA with the TTS implant.

METHODS: In this retrospective cohort study, US Medicare Standard Analytic Files (SAF) data was analyzed for patients undergoing THA between January 1, 2016 – December 31, 2023. A group of eleven fellowship trained surgeons specializing in the posterior approach were identified for the study, with five of them using TTS while six used other stems (non-TTS). The cohorts were defined based on the National Provider Identification (NPI) information of these eleven identified surgeons in the Medicare data. Any patients with an emergency procedure, fracture, infection, cancer diagnosis or bilateral THA were excluded. Study variables included 1) patient characteristics: age, sex, race, Elixhauser comorbidity score and Functional Comorbidity Index, 2) provider characteristics: procedure setting (inpatient or outpatient), hospital bed number geographic region and 3) procedural characteristics: year of admission. The follow-up period for the study was 24-months. The primary outcome was rate of reoperation (including excision, repair and resection along with removal and revision codes) within a 3-month follow-up period. The primary outcome was rate of reoperation as opposed to revision rate, due to limitations in reporting fewer than 11 incidents in SAF. The study was designed as a non-inferiority study and required a sample of 900 patients in each cohort at 3-month follow-up to achieve statistical significance. Exploratory outcomes were healthcare resource utilization and complication rates within a 2-year follow-up period with results reported at 1-, 3-, 12- and 24-months. Baseline covariate differences between the two cohorts were balanced using propensity score fine stratification and analyzed using generalized linear models.

RESULTS SECTION: Identified cohorts included 1,042 TTS and 1,483 non-TTS patients at index. Average patient age was 73 years for both cohorts. 89% of patients were White and 61% of patients were Female. Most patients (42%) had either one or two comorbidities with 13% of patients having more than five comorbid conditions across both cohorts. 70% of surgeries were carried out in an inpatient setting. Though regional differences were observed among patients, these differences remained minimal after balancing covariates across both cohorts. The reoperation rate at 3-month follow-up was 2.28% for the TTS cohort and 2.75% for the non-TTS cohort. The mean difference with 95% CI was -0.47% [-1.74% to 0.81%]. On average, dislocation rates trended lower for the TTS cohort while peri-prosthetic fracture rates trended higher. Within 24-months follow-up, the dislocation rate was 2.26% [1.17 to 3.36] for the TTS cohort compared to 4.6% [3.29 to 5.9] for the non-TTS cohort. During the same period, peri-prosthetic fracture rate was 2.11% [1.05 to 3.17] for the TTS cohort while non-TTS cohort had a rate of 1.07% [0.43 to 1.72]. Average Medicare claim payments were similar across both cohorts, with the TTS cohort having a payment of $29,310 and the non-TTS cohort a payment of $28,542 within 24-months of follow-up, inclusive of the index payment.

DISCUSSION: For posterior THA, the TTS cohort demonstrated a non-inferior rate of reoperation when compared to the non-TTS cohort. This underscores the robust performance of TTS used in a posterior approach. Previous studies have shown a lower fracture rate with modern TTS and the higher rate seen in this study likely stem from unstable estimates due to the limited sample size. Similarly, the difference in dislocation could possibly be due to subsidence but more likely related to the same sample size constraints. Overall, the healthcare resource utilization between the two cohorts were similar with differences likely arising due to surgeon or local preferences. These results should provide confidence and confirmation to surgeons that have already adopted TTS for their posterior approach THA procedures and provide reassurance to surgeons who are considering TTS for their posterior approach patients.

SIGNIFICANCE/CLINICAL RELEVANCE: (1-2 sentences): This study provides valuable evidence supporting the non-inferiority of the triple tapered medial collared cementless femoral stem (TTS) when used through a posterior approach in total hip arthroplasty, offering reassurance to surgeons adopting this implant. These findings help guide clinical decision-making by demonstrating comparable reoperation rates and healthcare resource utilization to other commonly used femoral stems.