The Cost-Effectiveness of Triple-Taper Wedge Femoral Stems in Primary Total Hip Arthroplasty

Background: Periprosthetic femoral fracture following primary total hip arthroplasty (THA) is associated with substantial morbidity, mortality, and cost. Recent data suggest that femoral stem geometry plays a critical role in fracture risk. The purpose of this study was to evaluate the cost-effectiveness of triple-taper wedge (TTW) femoral stems compared with single- or double-taper wedge (S/DTW) stems, with particular attention to complication-driven outcomes.

Methods: A Markov decision model was constructed to compare primary THA performed with TTW versus S/DTW stems. Transition probabilities, costs, and utilities were derived from published literature and registry data. Outcomes included complication rates, costs, and quality-adjusted life-years (QALYs). Cost-effectiveness was assessed using incremental cost-effectiveness ratios (ICERs) with a willingness-to-pay threshold of $50,000/QALY. Sensitivity analyses were performed to evaluate model robustness.

Results: TTW stems were associated with a lower probability of postoperative complications compared with S/DTW stems (1.1% vs 3.7%). This reduction in complications resulted in fewer downstream interventions, including revision THA and fracture fixation, and was associated with lower expected lifetime costs ($21,774 vs $22,009). TTW stems also demonstrated a small increase in effectiveness (0.36 vs 0.35 QALYs). Overall, TTW was the dominant strategy, with lower costs and greater effectiveness. Sensitivity analyses demonstrated that these findings were primarily driven by differences in complication rates and remained stable across plausible parameter ranges.

Conclusion: In this Markov-based analysis, TTW femoral stems were associated with lower complication rates and reduced downstream costs compared with single- or double-taper wedge designs. Although differences in QALYs were small, the economic advantage of TTW stems was driven by reduced complication burden. These findings suggest that implant selection strategies that prioritize complication prevention may improve value in total hip arthroplasty.