Defining Quality of Life and Cost-Effectiveness of Treatment for First Time and Recurrent Patellar Instability: Data from the JUPITER Cohort

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INTRODUCTION:

While first-time patellofemoral instability (PFI) has traditionally been managed non-operatively, recent studies suggest surgical intervention offers improved clinical outcomes. With increasing operative management over the past two decades and scrutiny over surgical costs, this study evaluates the cost-effectiveness of nonoperative, immediate operative, and delayed operative treatment for first-time and recurrent patellar instability. Further, this study compares the cost-effectiveness of medial patellofemoral ligament (MPFL) reconstruction versus medial patellofemoral ligament reconstruction with tibial tubercle osteotomy (MPFL-R with TTO).

METHODS:

Using the Justifying Patellar Instability Treatment by Results (JUPITER) cohort, patients prospectively enrolled from 2017-2022 with 1-year follow-up or more from treatment of PFI were included. Those who underwent previous ipsilateral knee surgery were excluded. Patients were categorized into either first-time or recurrent PFI group. Each group was then split into three lifestyle alteration states: 1) severe to total alteration to lifestyle, 2) mild to moderate alteration to lifestyle, and 3) no alteration to lifestyle. The Knee Injury and Osteoarthritis Outcome Score (KOOS) Q2 question was used as an anchor to define these states. Each state was then assigned a Quality Adjusted Life Year (QALY) score from 0-100 based on the validated Banff Patellofemoral Instrument II (BFII) score for the annual assessment of patellofemoral treatment effectiveness. Transitions between lifestyle states from treatment to 2 years were modeled using JUPITER derived probabilities, and 2-5 years using literature derived probabilities. A Markov state transition model was constructed to assess the cost-effectiveness of each treatment modality and ran for 5 cycles, representing 5 years. Transition state probabilities from years 2-5 were derived from existing literature. Cost of surgery, physical therapy, parental leave, and bracing were also derived from current literature and adjusted to inflation. A final incremental cost-effectiveness ratio (ICER) was used to compare cost-effectiveness between treatment modalities.

RESULTS: In total, 307 first-time and 380 recurrent dislocators met inclusion criteria. Immediate operative treatment had the highest QALY accrual for first-time PFI (3.15 QALYs) and recurrent PFI (4.03 QALYs) over a 4-5 year period, while delayed operative treatment had the lowest (2.09 QALYs). MPFL-R alone yielded higher QALY accrual (4.04 QAYs) than MPFL with TTO (3.82 QALYs). For first-time PFI, immediate operative treatment produced the most favorable ICER of $29,390/QALY, while delayed surgery had the least favorable ICER of -$42,143/QALY. Similarly, for recurrent PFI, operative treatment produced the most favorable ICER of $11,563/QALY. The ICER of $26,124/QALY for MPFL-R was more favorable when compared to the ICER of $65,410/QALY for MPFL-R with TTO.

DISCUSSION AND CONCLUSION:

Over a 5-year period, operative treatment provided the highest utility amongst patients with first-time and recurrent PFI. Delayed operative treatment led to the lowest utility scores in both groups, emphasizing the importance of choosing the correct treatment modality from patients' initial presentation and avoiding delay of definitive treatment. Given that operative treatment provides the highest utility of all, there is further support for its utilization among both first-time and recurrent PFI as the gold standard treatment for patellar instability. Given the most favorable cost-effectiveness scores in both groups are within the "willingness to pay" threshold ($50,000/QALY) for the average American consumer, this provides additional evidence that early operative management as the preferred approach for PFI. Further, while our data reflects that MPFL reconstruction alone is more cost-effective when compared to MPFL-R with TTO, there was only a small difference in QALY accruals between both treatment groups. Thus, more research should be conducted on the role of bony realignment in patellar stabilization.