Total Hip Arthroplasty is the Most Cost Effective Treatment for Nondisplaced Femoral Neck Fractures

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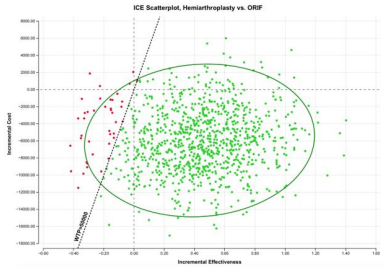
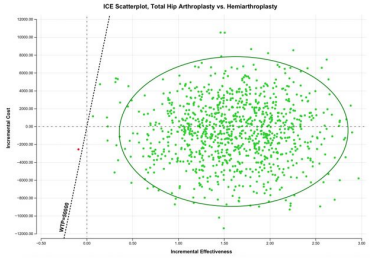
INTRODUCTION:
Nondisplaced femoral neck fractures can be challenging to treat, as the femoral neck lacks periosteum and therefore relies on direct bone healing, leading to higher rates of nonunion or osteonecrosis of the femoral head. To our knowledge, cost-utility analysis of open reduction internal fixation (ORIF) versus hemiarthroplasty (HA), and total hip arthroplasty (THA) in patients with non-displaced femoral neck fractures has not been reported in previous literature. This study aimed to perform a cost-utility analysis between initial treatment with open reduction and internal fixation versus hemiarthroplasty and total hip arthroplasty (THA) in patients with nondisplaced femoral neck fractures.
METHODS: A decision-analysis model was built for a hypothetical 60-year-old patient diagnosed with a nondisplaced femoral neck fracture requiring surgical management. A comprehensive review of the literature was performed to obtain event probabilities, costs and health utilities at each node. Event probabilities included surgery revision rate after ORIF, HA, or THA for non-displaced femoral neck fractures. Health utilities were used to calculate Quality-Adjusted Life Years (QALYs). A base-case analysis was carried out to obtain the incremental cost and effectiveness of ORIF versus HA or THA. Probabilistic sensitivity analysis was performed to evaluate uncertainty in our model and obtain mean incremental costs, effectiveness, and net monetary benefits. One-way sensitivity analyses were also performed to identify the variables with the most impact on our model.
RESULTS: Treatment with THA was favored in 99% of the iterations in our model. The mean incremental utility ratio for treating with THA demonstrated higher benefit and lower cost while being lower than the willingness-to-pay (WTP) threshold set at $50,000 per QALYs. HA treatment in comparison to ORIF was associated with a mean incremental net monetary benefit (INMB) of $27,613± 15,708 (SD). THA compared to HA was associated with a mean INMB of $80,693 ± 25,673 (SD). One-way sensitivity analysis reported QALY in revision ORIF surgery and cost of revision surgery to be the main determinant factors.
DISCUSSION AND CONCLUSION:
Our study unequivocally demonstrates that the utilization of total hip arthroplasty is the most cost-effective strategy for treating nondisplaced femoral neck fractures. Having said that, this economic analysis should be used in conjunction with patient-specific characteristics to aid the surgeon's decision in providing best patient care.

Figure 2: Incremental cost-effectiveness scatterplot of HA versus ORIF as comparison intervention. WTP was set at $50,000/QALY.



Green dots, simulations where HA was favored; Red dots, simulations where HA was not favored.

Figure 3: Incremental cost-effectiveness scatterplot of THA versus HA as comparison intervention. WTP was set at $50,000/QALY.



Green dots, simulations where THA was favored; Red dots, simulations where THA was not favored.

Figure 1: A decision-analysis model for a hypothetical patient with a non-displaced proximal femoral fracture indicated for surgical treatment.