Fixation versus Acute Total Hip Arthroplasty for Acetabular Fracture: A Systematic Review and Cost-Effectiveness Analysis

Ben Kelley[1], Dane Jensen Brodke, Alexander Upfill-Brown[2], Sai Devana, Erik Mayer[3], Brendan Shi, Brian HANNAH MOONEY, Troy Sekimura[1], Christopher Lee[4]
[1]UCLA Department of Orthopaedic Surgery, [2]David Geffen School of Medicine At UCLA, [3]UCLA Medical Center, [4]UCLA

INTRODUCTION:

The optimal treatment of acetabulum fractures in elderly patients is unknown. The purpose of this study was to systematically review the literature on the costs and outcomes of open reduction internal fixation (ORIF) and acute total hip arthroplasty (aTHA) in the acetabulum fracture population and to employ decision modeling techniques to generate evidence-based treatment recommendations based on cost-effectiveness.

METHODS:

Costs, health state utilities, reoperation rates, and mortality rates were systematically reviewed from clinical studies in the last 20 years reporting results of fixation or arthroplasty for operative acetabulum fractures in patients of any age. A Markov decision analysis model was constructed. The model was analyzed with a willingness-to-pay threshold set at $100,000 per QALY and a lifetime time horizon to determine if there is an age threshold when aTHA becomes more cost-effective than ORIF. Sensitivity analyses were performed with regard to the quality of life and cost variables.

RESULTS:

Eighty studies met inclusion criteria for systematic review including 64 studies (N=10,580) reporting on ORIF and 23 studies (N=438) reporting on aTHA (Table 1). The ORIF cohort had a mean age of 45 years, mean follow up of 8 years, mortality rate of 4.2%, and a conversion arthroplasty rate of 16%. The aTHA cohort had a mean age of 73 years, mean follow up of 3 years, mortality rate of 12%, and a revision rate of 5% (Table 2). Within the ORIF cohort, the overall rate of conversion arthroplasty was 16% and progressively increased with age from 8% in patients aged 20-29 to 24% in patients 80-89 (Table 3). The model input variables including the results of the systematic review are summarized in Table 4. The model output cost and quality adjusted life-years of ORIF or aTHA were calculated by age (Table 5). This model demonstrated that ORIF was a more cost-effective treatment for patients 67 years or younger and that aTHA was more cost-effective for patients 68 years and older (Figure 2). Sensitivity analysis demonstrated that this result was robust to small deviations in the cost of ORIF and aTHA, however the result (Figure 3A). In contrast, the result was highly sensitive to changes in the value of utility placed on functional outcome variables (i.e., EQ-5D scores) in the model (Figure 3B).

DISCUSSION AND CONCLUSION:

A systematic review of 80 studies addressing ORIF and aTHA for acetabulum fracture demonstrated conversion arthroplasty rates over 20% for patients over the age of 60 compared to a revision rate of 5% for elderly patients treated with aTHA. Compared to ORIF, aTHA is a more cost-effective treatment for surgically treated acetabulum fractures in patients 68 years or older.