

A 5-Year Cost-Utility Analysis for Different Dosages of Recombinant Bone Morphogenetic Protein 2 Use in Minimally Invasive Transforaminal Lumbar Interbody Fusion for Degenerative Lumbar Pathologies

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INTRODUCTION:

The utilization of Recombinant Bone Morphogenetic Protein 2 (rhBMP-2) has been shown to lower pseudoarthrosis rates in the setting of Minimally Invasive Transforaminal Lumbar Interbody Fusion (MIS TLIF), however its cost-effectiveness has not been previously demonstrated. Therefore, in this study we attempt to evaluate the cost-effectiveness of rhBMP-2 use at different dosages as a treatment strategy in adult patients undergoing MIS TLIF.

METHODS: Three decision trees comparing LBG + three different doses of rhBMP-2 use versus use of LBG alone was built for a hypothetical 60-year-old man with degenerative lumbar pathology (DLP) requiring surgery. A comprehensive review of the literature was performed to obtain event probabilities, costs and health utilities. Health utilities were utilized to calculate Quality-Adjusted Life Years (QALYs). A base-case analysis was carried out to obtain the incremental cost and effectiveness (QALYs) of rhBMP-2 utilization in MIS TLIF. A probabilistic sensitivity analysis was performed using 1000 Monte Carlo simulations to evaluate the uncertainty in our model and obtain mean incremental costs, effectiveness, and net monetary benefits. One-way deterministic sensitivity analyses were also performed to identify the variables with most impact on our base-case results.

RESULTS: MIS TLIF with LBG + rhBMP-2 was favored on base-case analysis 64% and 80% of the Monte Carlo simulations in models that used x-small and xx-small dosages respectively. Model that evaluated using small dose rhBMP-2 was not favored on base-case analysis. The mean INMB and ICER of small dose rhBMP-2 utilization were -\$1,314 (95% CI: -\$1,207- -1,421) and \$151,914 (95% CI: \$131,058-180,528) at a WTP threshold of \$50,000/QALY, respectively. The mean INMB and ICER of x-small dose rhBMP-2 utilization were \$624 (95% CI: \$514-734) and \$7,770 (95% CI: \$5,721-10,186) at a WTP threshold of \$50,000/QALY, respectively. The mean INMB and ICER of xx-small dose rhBMP-2 utilization were \$1,471 (95% CI: \$1,367-1,575) and -\$65,736 (95% CI: -\$78,147-56,651) at a WTP threshold of \$50,000/QALY, respectively. On one-way deterministic sensitivity analysis, the three parameters with most effect on the conclusions of our model were the probability of pseudoarthrosis with LBG only, the cost of revision, and the effect of nonunion on patient quality of life.

DISCUSSION AND CONCLUSION: Cost-utility analysis supports the use of x-small and xx-small dosages of rhBMP-2 in adult patients undergoing MIS TLIF for lumbar degenerative pathologies.

Figure 1. A decision analysis model for a hypothetical 60-year-old patient undergoing an TLIF for DLP using LBG + small dose rhBMP-2 or LBG only.

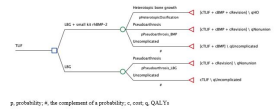


Figure 2. A decision analysis model for a hypothetical 60-year-old patient undergoing an TLIF for DLP using LBG + x-small dose rhBMP-2 or LBG only.

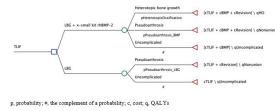


Figure 3. A decision analysis model for a hypothetical 60-year-old patient undergoing an TLIF for DLP using LBG + xx-small dose rhBMP-2 or LBG only.

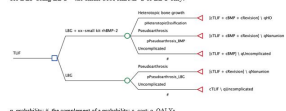


Figure 4. Incremental cost-effectiveness scatterplot of TLIF with LBG + small dose rhBMP-2 vs. TLIF with LBG only as comparison intervention. WTP was set at \$50,000/QALY.

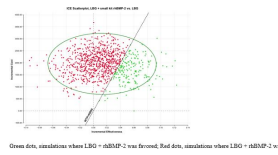


Figure 5. Incremental cost-effectiveness scatterplot of TLIF with LBG + x-small dose rhBMP-2 vs. TLIF with LBG only as comparison intervention. WTP was set at \$50,000/QALY.

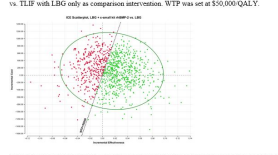


Figure 6. Incremental cost-effectiveness scatterplot of TLIF with LBG + xx-small dose rhBMP-2 vs. TLIF with LBG only as comparison intervention. WTP was set at \$50,000/QALY.

