

Expected Value Decision Making in Upper Extremity Transplantation

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BACKGROUND

Decision Analysis is a method to make the best choice in the face of uncertainty. Expected Value decision making is a commonly used method to apply formal decision analysis to a medical decision. We first applied this to upper extremity transplantation before the first modern hand transplant in France in 1998. Chung has since repeated this analysis and added a cost analysis in the tree. We expand the decision tree to include the probability of good and poor functional recovery as defined by Chen's criteria.

APPLICATION OF CHEN'S CRITERIA

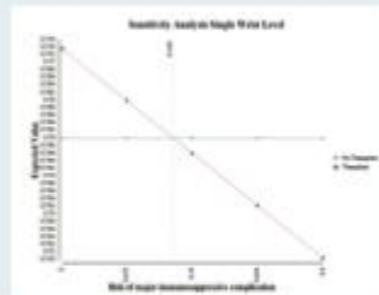
Chen has linked the anatomic level of replantation to the probability of a given level of functional recovery, Chen's score 1 through 4. We believe that a Chen score of 1 or 2 can be considered a successful functional recovery after transplantation and Chen score of 3 or 4 could be considered a failure from the functional standpoint. Adding the probability of achieving a Chen level 1 or 2 provides the capability of considering functional recovery in a decision tree.

RESULTS

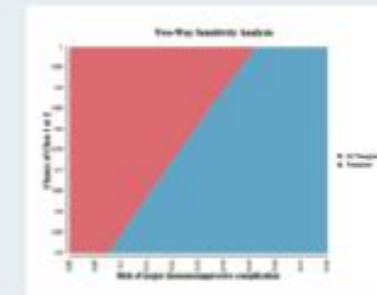
The expected value of bilateral transplantation is higher than unilateral transplantation. Bilateral transplantation has a higher expected value than no transplantation. No transplantation has a higher expected value than unilateral transplantation for a unilateral amputation. Given our base case in this model, which allows for a relatively high utility for poor functional recovery, the level of amputation did not show a large effect on expected value.



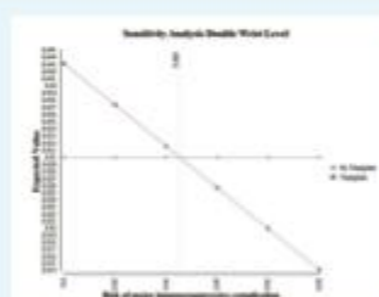
Single Hand Transplant at Distal Forearm



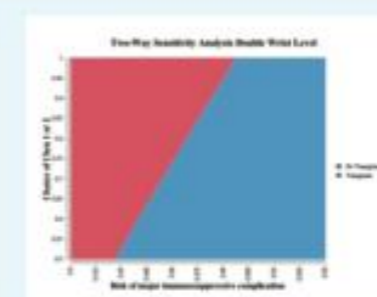
Transplantation is preferred in unilateral if the risk or a major complication is less than 13%



Bilateral Hand Transplant at Distal Forearm



Transplantation is preferred in a bilateral if the risk or a major complication is less than 47%



CONCLUSION

Expected Value Decision Making is a logical method to evaluate the indications for upper extremity transplantation. Further study should be done to measure the utilities of the relevant states of health including the utility of a transplanted arm with little or no function.