



Digital Subtraction Angiography in CT Angiography Negative Spontaneous Subarachnoid Hemorrhage: A Cost-Effectiveness Analysis

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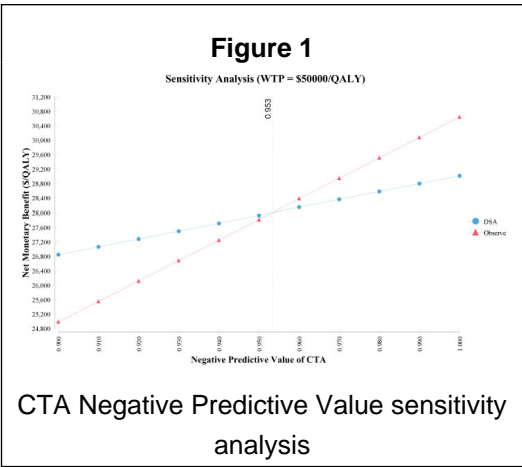


Introduction

Recent studies have documented the high sensitivity of CT angiography (CTA) in detecting a ruptured aneurysm in the presence of acute subarachnoid hemorrhage (SAH). The practice of digital subtraction angiography (DSA) when CTA does not reveal an aneurysm has thus been called into question. We examined the efficacy of DSA in CTA negative SAH when balanced with the costs and risks associated with the procedure.

Methods

A decision tree was created using TreeAge Pro Suite 2012; in one arm a CTA negative SAH was followed-up with DSA, in the other arm patients were observed without further imaging. Based on literature review, costs and utilities were assigned to each potential outcome. Base case and sensitivity analysis were performed to determine the cost effectiveness of each strategy. A Monte Carlo simulation was then conducted, by sampling each variable over a plausible distribution, to evaluate the robustness of the model.

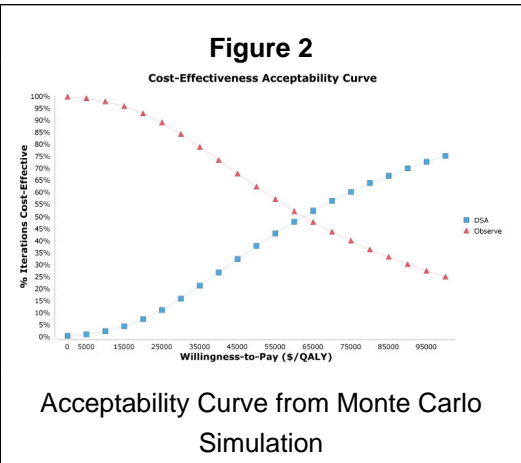


CTA Negative Predictive Value sensitivity analysis

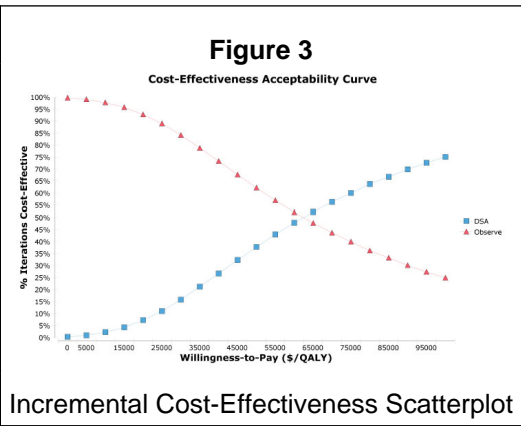
Results

Using a mean value for all variables in the model, as well as a willingness-to-pay (WTP) threshold of \$50,000/QALY, "Observation" was found to be the most cost effective strategy (\$9,481.43/QALY vs. \$10,884.53/QALY), in the base case analysis. One-way sensitivity analysis demonstrated that DSA became the more cost effective option if the NPV of CTA fell below 95.3% (Figure 1). The Monte Carlo simulation produced an incremental cost-effectiveness ratio of \$55,333/QALY. At the conventional WTP of \$50,000/QALY, observation was the more cost effective strategy in 62.2% of simulations.

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Acceptability Curve from Monte Carlo Simulation



Incremental Cost-Effectiveness Scatterplot

Conclusions

The results of this analysis support observation as the more cost effective clinical strategy when a CTA negative SAH is encountered in the majority of real world scenarios. Patients need not be subjected to the costs and risks associated with conventional angiography given the high sensitivity of modern CTA. DSA should be reserved for patients exhibiting a clinical exam incongruent with perimesencephalic SAH.

Learning Objectives

To evaluate the cost effectiveness of digital subtraction angiography for patients with subarachnoid hemorrhage in which CT angiography does not demonstrate an aneurysm.