

**Title:** Using CT Perfusion to Predict Outcome for Ischemic Stroke Patients following Intra-Arterial Therapy

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**Structured Abstract:**

**Introduction:** The EXTEND-IA, ESCAPE and MRCLEAN trials have shown that intra-arterial therapy (IAT) is superior to IV-tPA for patients with large vessel occlusions. IAT involves guiding a catheter to the occlusion site to remove the clot. Success of recanalization is judged using the modified thrombolysis in cerebral ischemia (mTICI) scale on post-treatment digital subtraction angiography (DSA) images - successful procedures are defined as a score of 2b or 3 since these scores are thought to represent near-complete or complete reperfusion of the target downstream territory. However, ~17% of IAT-treated patients in the previously mentioned trials had poor functional outcomes despite mTICI scores of 2b/3. CT Perfusion (CTP) provides a more quantitative evaluation of tissue perfusion than DSA, and may be better able to identify patients with incomplete reperfusion, who may have poor outcomes. This study's objective was to derive a reperfusion threshold for predicting outcome in ischemic stroke patients treated with IAT, and to compare its accuracy in predicting outcome with the mTICI scores accuracy in predicting outcome.

**Methods:** 97 stroke patients treated with IAT from June 2008 to August 2014 who received admission and 24h follow-up CTP, post-IAT DSA, and functional evaluation at 90 days using the modified Rankin Scale were included in the study. Ischemic tissue volume was quantified on admission and 24h CTP images using time-to-maximum thresholds, and the percent change in volume between admission and 24h was defined as the reperfusion score. ROC analysis was used to find the optimal reperfusion score threshold for predicting outcome, and logistic regression was used to find the association between outcome and reperfusion score, mTICI score and other clinical variables.

**Results:** Mean reperfusion score in the good and poor outcome groups were  $81 \pm 4$  and  $43 \pm 6\%$  respectively. The optimal reperfusion score threshold of 79% had sensitivity and specificity of 0.8 and 0.67 respectively. The reperfusion score threshold correctly predicted outcome in 73% of patients, whereas TICI 2b/3 only correctly predicted outcome in 62% of patients. A backward-elimination logistic regression produced a model using admission NIH Stroke Scale ( $p < 0.001$ ), hemorrhagic transformation ( $p < 0.01$ ), and reperfusion score ( $p < 0.01$ ) to predict outcome, resulting in correct outcome prediction in 78% of patients.

**Discussion/Conclusion:** Post-treatment CTP is a more accurate predictor of outcome than the mTICI score in IAT-treated stroke patients. Performing CTP after therapy may allow patients with impaired tissue reperfusion to be identified and triaged into additional therapies.