Subject: Cerebral Perfusion Analysis using Computed Tomography (CT)

Background: Computed tomography (CT) perfusion imaging provides a quantitative measurement of regional cerebral blood flow. A perfusion CT study involves sequential acquisition of CT sections during intravenous administration of an iodinated contrast agent. Analysis of the results allows the physician to calculate the regional cerebral blood volume, the blood mean transit time through the cerebral capillaries, and the regional cerebral blood flow. CT perfusion imaging has been proposed to be used primarily as a method of evaluating patients suspected of having an acute stroke whenever thrombolysis is considered.

Policy and Coverage Criteria:
Harvard Pilgrim Health Care (HPHC) considers cerebral perfusion analysis using computed tomography as experimental/investigational, and it is therefore not covered.

Supporting Information:
Perfusion computed tomography is an imaging modality that uses a contrast agent to provide quantitative measurements of regional cerebral blood flow. Maps of cerebral blood volume, mean transit time, and cerebral blood flow can be obtained from a pixel-by-pixel analysis of the density changes over time. The maps generated depend on the commercial software and algorithms used in the processing of the data.

Available clinical evidence does not support the use of CT cerebral perfusion analysis. Rawal et al. (2015) conducted an analysis on the effectiveness of diagnostic strategies in suspected delayed cerebral ischemia. Diagnostic testing to assess for perfusion deficits included CT perfusion. The authors concluded that imaging studies to test for the presence of perfusion deficits in patients with clinical delayed cerebral ischemia do not seem helpful in selecting which patients should undergo treatment and may not improve outcomes. Sun et al. (2014) conducted a meta-analysis of 3 articles to evaluate the diagnostic accuracy of CT perfusion and CT perfusion parameters for vasospasm after aneurysm rupture. The authors concluded that CT perfusion has a great diagnostic value to detect cerebral vasospasm in patients with aneurysmal subarachnoid hemorrhage. Bendinelli et al. (2013) conducted an analysis of an ongoing prospective observational study on trauma patients with severe traumatic brain injury (STBI) to determine the role of brain CT perfusion imaging. When compared to non-contrast CT, CT perfusion provided additional diagnostic information in 60% of the patients but only altered clinical management in 10% of the patients. Obach and colleagues (2011) compared the outcomes of 106 subjects with acute stroke who were assessed with multimodal CT (CT angiography CTA/CT perfusion) to 262 subjects with acute stroke who were assessed without full multimodal brain imaging during a 5-year period. The two groups were similar at baseline with the exception of a greater percentage of participants with a time-to-treatment of greater than 3 hours (28% vs. 16%) and a greater percentage treated with endovascular therapy (26% vs. 11%, respectively) in the multimodal CT group. At three months, 56% of participants assessed by multimodal CT demonstrated good outcomes (defined as a modified Rankin scale score less than or equal to 2 at 90 days) in comparison with 41% of controls (p=0.008).
In a sensitivity analysis, multimodal-CT assisted thrombolysis yielded superior benefits in those subjects treated after 3 hours (adjusted OR, 4.48) than for subjects treated within 3 hours (adjusted OR, 1.31). For subjects treated after 3 hours, 63% of those assessed by multimodal CT demonstrated good outcomes in comparison with 24% of the control group. Symptomatic hemorrhage (5% and 7%) and mortality (14% and 15%, both respectively) were similar in both groups. The authors concluded the use of multimodal CT in routine clinical practice may heighten overall efficacy of thrombolytic therapy in acute ischemic stroke, but noted additional randomized clinical trials are needed.

A 2008 systematic review by Provenzale et al. focused on both CT and MRI perfusion imaging in the assessment of acute cerebrovascular disease. The review found literature provided important insights into the physiologic processes underlying acute cerebral ischemia by correlation of initial perfusion imaging deficits with clinical outcome or ultimate size of the infarct. However, the studies did not show a clear role of perfusion imaging in clinical decision making. Provenzale et al. noted more studies are needed to demonstrate that use of perfusion imaging changes outcomes of patients with acute cerebral ischemia.

A 2005 AHRQ Technology Assessment noted CT and MR imaging for patient selection and prediction of outcome in thrombolysis has yet to be prospectively evaluated. The two included CT studies differ in onset to evaluation time with only a weak correlation between CT changes and outcome seen in the trial enrolling patients from 0-6 hours. Neither study quantified CT changes.

American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Council, Cardiovascular Radiology and Intervention Council, and the Atherosclerotic Peripheral Vascular Disease and Quality of Care Outcomes in Research Interdisciplinary Working Groups: The role of perfusion CT and CT angiography in making acute treatment decisions has not yet been established.

**Coding:**

Codes are listed below for informational purposes only, and do not guarantee member coverage or provider reimbursement. The list may not be all-inclusive. Deleted codes and codes which are not effective at the time the service is rendered may not be eligible.

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<tr>
<td>0042T</td>
<td>Cerebral perfusion analysis using computed tomography with contrast administration, including post-processing of parametric maps with determination of cerebral blood flow, cerebral blood volume, and mean transit time</td>
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**References:**


Summary of Changes

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