Reliability Assessment of the Biffl Scale for Blunt Traumatic Cerebrovascular Injury as Detected on Computer Tomography Angiography


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Introduction
Blunt traumatic cerebrovascular injury (TCVI) represents structural injury to a vessel due to high-energy trauma. The Biffl Scale is a widely accepted grading scheme for these injuries that was developed using digital subtraction angiography. In recent years, screening computed tomography angiography (CTA) has been used to identify patients with TCVI. The reliability of this scale, using CTA, has not yet been determined.

Methods
Seven independent raters, including two neurosurgeons, two neuroradiologists, two neurosurgical residents, and one neurosurgical vascular fellow independently reviewed a presenting CTA of the neck performed on 40 patients with confirmed TCVI and assigned a Biffl grade. Ten images were repeated to assess intra-rater reliability, for a total of 50 CTAs. Fleiss's multi-rater kappa and interclass correlation were calculated as a measure of inter-rater reliability. Weighted Cohen’s kappa was used to assess intra-rater reliability.

Results
Fleiss's multi-rater kappa was 0.65 (95% CI 0.61 - 0.69), indicating substantial agreement as to the Biffl grade assignment among the seven raters. Interclass correlation was 0.82 demonstrating excellent agreement among the raters. Intra-rater reliability was perfect (weighted Cohen’s kappa = 1) in two raters and near perfect (weighted Cohen’s kappa > 0.8) in the remaining 5 raters.

Conclusions
Grading of TCVI with CTA using the Biffl Scale is reliable.