CTIDES: Classification System for Traumatic Brain Injuries

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Learning Objectives

- Understand current challenges in TBI research
- Explain how CTIDES works
- Demonstrate the preliminary value of CTIDES

Introduction

Current traumatic brain injury (TBI) classification systems fail to consider the different types of trauma-induced intracranial pathology. CTIDES accounts for the 6 types of injury commonly seen on imaging:

- **C**erebral contusions/intraparenchymal hemorrhage **(IPH)**
- **T**raumatic subarachnoid hemorrhage **(tSAH)**
- **I**ntraventricular hemorrhage **(IVH)**
- **D**iffuse axonal injury **(DAI)**
- **E**pidural hematoma **(EDH)**
- **S**ubdural hematoma **(SDH)**

Simple stratification of TBI patients via available radiologic data will allow for easy patient grouping and improved outcome prediction

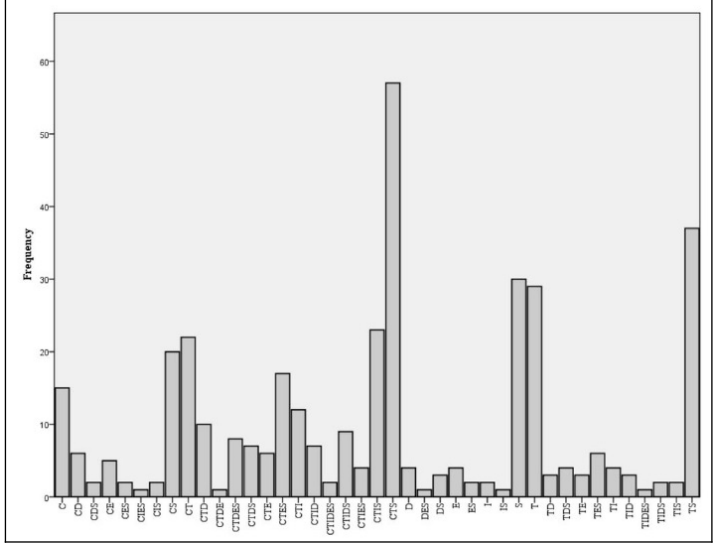
Methods

- Retrospective study of admitted TBI patients at a level 1 trauma center between June 2009 and June 2014
- Inclusion criteria: 18-years of age or older, presence of blunt TBI, and availability of CT results.
- Exclusion criteria: penetrating head trauma
- Outcome measures: age, 24-hour and 1-week GCS

Results

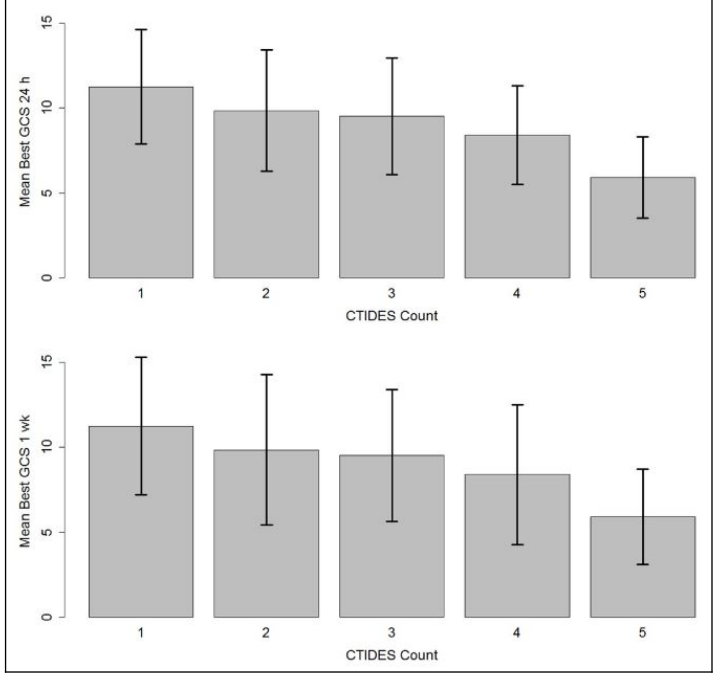
- A total of 379 patients were included in the analysis.
- Mean age was 40.7.
- Most common injury type was a CTS and mean CTIDES count was 2.5 (SD=1.18).
- 53.44% of all patients were GCS 6 or less.

Distribution of observed CTIDES combinations



- There was a positive correlation between the accumulation of CTIDES count and decreasing GCS within 24 hours post-injury (p=0.004).
- For every increase in CTIDES variables, the predicted presenting GCS declined by 0.37 points on average, and the odds of being in the worst GCS category at 1 week increased by 64%
- As the number of CTIDES variables increases, the average GCS at one week decreases in a 1:1 fashion.
- The presence of I increased the odds of dying significantly (p=0.0076).
- No other CTIDES variable correlated with death at one week.

CTIDES count vs. 24-hour and 1-week GCS



Conclusions

- CTIDES classification of TBI is a simple and practical tool for subclassifying TBI
- CTIDES demonstrated preliminary value as an alternative to the more complex Marshall, Rotterdam, and Helsinki scoring systems
- External validation of CTIDES using independent data sets is needed

References

Maas, A.I., Hukkelhoven, C.W., Marshall, L.F. and Steyerberg, E.W. (2005). Prediction of outcome in traumatic brain injury with computed tomographic characteristics: a comparison between the computed tomographic classification and combinations of computed tomographic predictors. Neurosurgery 57, 1173-1182; discussion 1173-1182.

Raj, R., Siironen, J., Skrifvars, M.B., Hernesniemi, J. and Kivisaari, R. (2014). Predicting outcome in traumatic brain injury: development of a novel computerized tomography classification system (Helsinki computerized tomography score). Neurosurgery 75, 632-646; discussion 646-637.