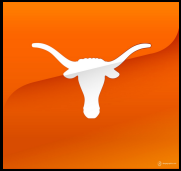


CT CBV Perfusion Mapping As A Sign of Futility In Acute Ischemic Stroke

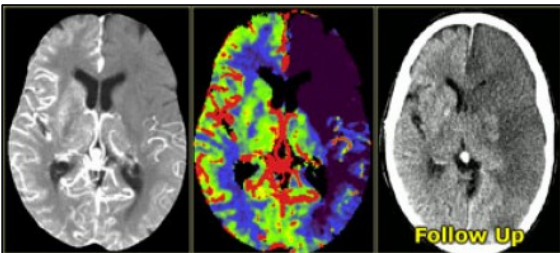
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Background and Objective

Ischemic strokes constitute 80% of all strokes nationwide, but an imaging technique for predicting patient outcome is yet to be determined. This study effectively tests whether the Cerebral Blood Volume (CBV) imaging modality is a parameter of perfusion calculated from multiple CT images following contrast injection. CBV can be roughly equated to the total amount of blood flow to a region of interest over a given time frame. CBV regions on the brain may be equated to completion of the ischemic window and is a marker for loss of tissue viability.



MRI CT Perfusion CT

Methods

13,000 CT perfusion scans performed on identical scanners and paradigms from 2000 to 2010 were reviewed. A total of 451 showed measurable changes of perfusion/ischemia. CBV values were calculated and compared with final infarct size, calculated from CT (217) and MRI (234) scans performed 24+ hours after the initial infarct. Patient outcomes were divided into three categories based on hospital discharge: hospice/death, discharge to rehabilitation facility, or healthy discharge to home.

Results

Larger median CBV values correlate directly with adverse outcomes (patient death and discharge to hospice facilities). CBV almost always equates to areas of non-viability. Only 2 cases (0.5%) were found where there was no immediate change of infraction within 24 hours. In the 2 outliers, long term follow up showed atrophy corresponding to the CBV changes suggesting initial follow up scans may not fully represent the extent of ischemic damage.

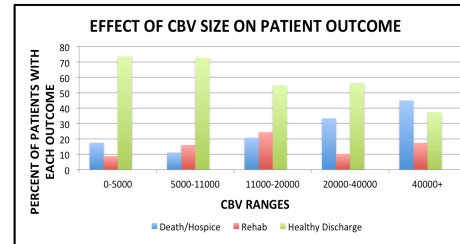


Fig. 1: An illustration of CBV ranges and patient outcome frequency.

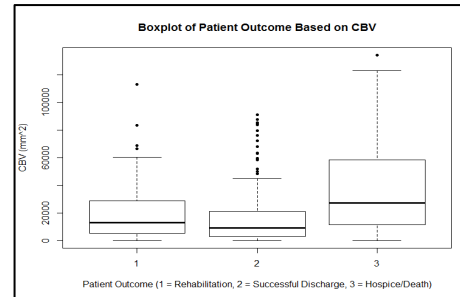


Fig. 2: A boxplot illustrating median values of the various patient outcomes. Average CBV of death/hospice is significantly higher than those of other outcomes.

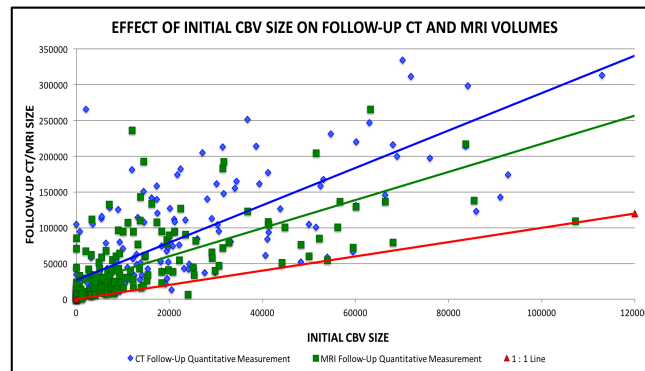


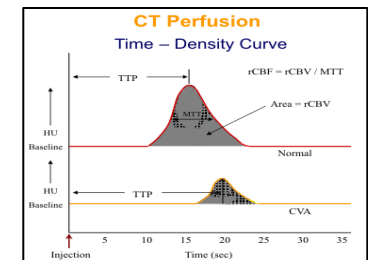
Fig. 3: A scatterplot comparing initial CT scans to CT and MRI follow-ups. The lines of best fit show slopes greater than 1, showing that follow-up values rarely decrease from initial readings. The 1:1 line was used as the standard.

Impact

Strokes represent a significant social and economic burden. Understanding the viability of tissue in acute ischemic strokes can allow physicians to better plan treatment paradigms and predict outcome.

Time, effort, and money can be allocated more efficiently, as medical resources and procedures can be used on the patients who need them most.

Our multi-site study shows that CBV can be used as an effective predictor of completed stroke (futility) and that the value of CBV is an excellent predictor of patient clinical outcome.



References

- Mokin M, Morr S, Fanous AA, et al. J NeuroIntervent Surgery 2015; 7:705-708.
- Becske, Tibor, and Maksim Shapiro. "Acute Ischemic Stroke." NYU School of Medicine.