Validation of the NIH Stroke Scale Score for Clinical Assessment of Intracerebral Hemorrhage

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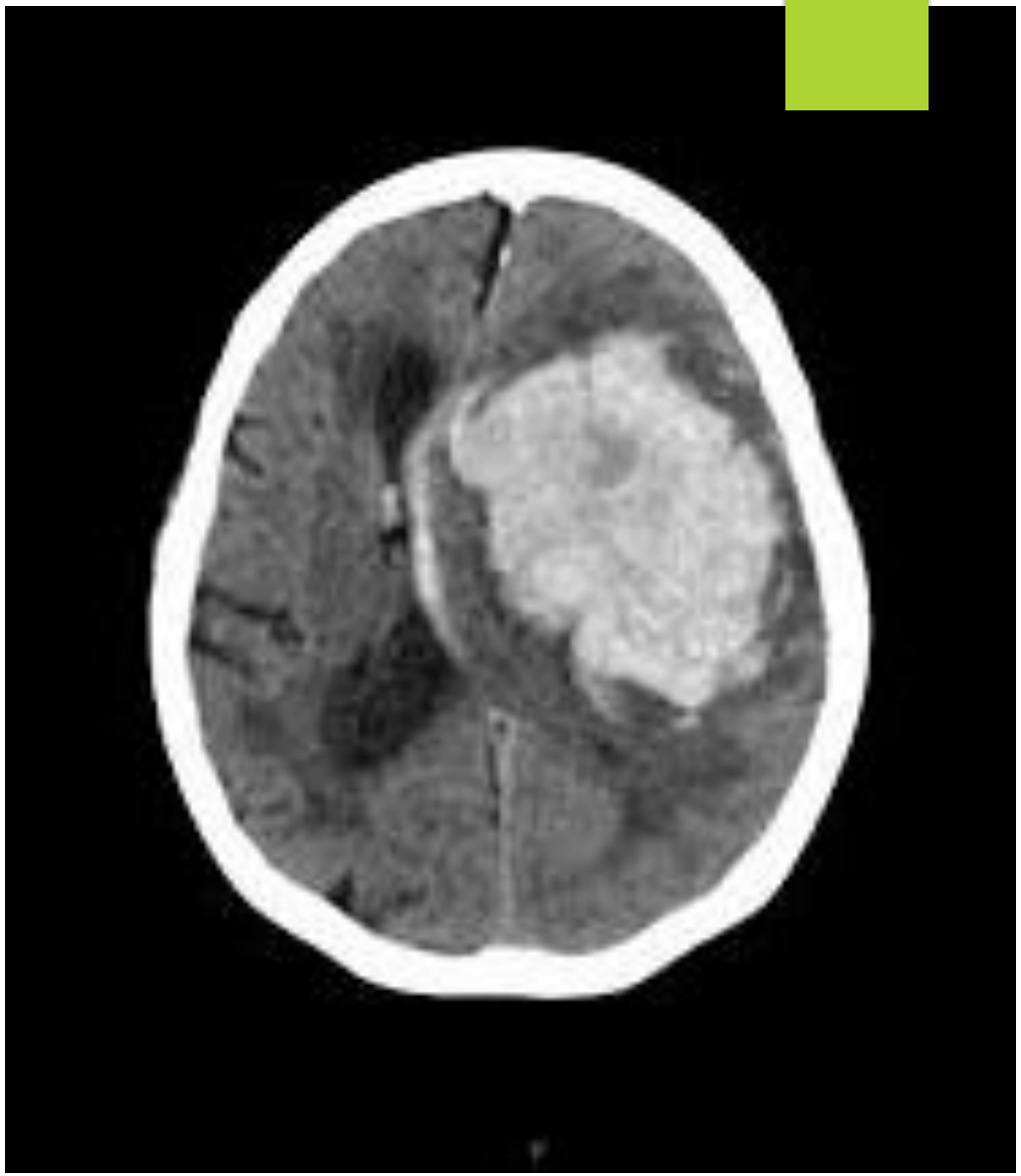
Background

- Both the Glasgow Coma Scale (GCS) and NIH Stroke Scale (NIHSS) are commonly used as serial assessment tools in ICH, however, the NIHSS lacks formal validation in this population
- Glasgow Coma Scale (GCS) has been widely used as a neurologic assessment measure yet its validity and reliability were established as a prognostic tool in patients with traumatic brain injury
  - GCS scores require recording the patient's "best response" so that in stroke patients with normal LOC, the disabled side would not be scored if the tool were used correctly
- ICH Score was developed to prognosticate outcome after ICH, but is not useful in serial assessments
- Serial neurologic assessments are essential to understanding stability, improvement and deterioration in acute stroke patients

Methods

- We prospectively collected ICH assessments, imaging, and outcome data over a 4.5 year period.
- Direct comparisons of discrimination were made using GCS and NIHSS on prediction of 24-hour poor functional outcome (mRS-3-6) and hematoma volume >30cm^3 using ROC analysis; c statistics were calculated and compared with DeLong test.



Results

- 672 ICH patients were studied:
  - Mean age was 62 ± 14 years
  - 56% were men
  - Median ICH score was 1 (IQR 0-2) point
  - Median ICH volume was 7 (IQR 2-19) cm^3
  - Median NIHSS was 8 (IQR 3-18) points
  - Median GCS was 15 (IQR 7-15) points

- NIHSS inversely correlated to GCS

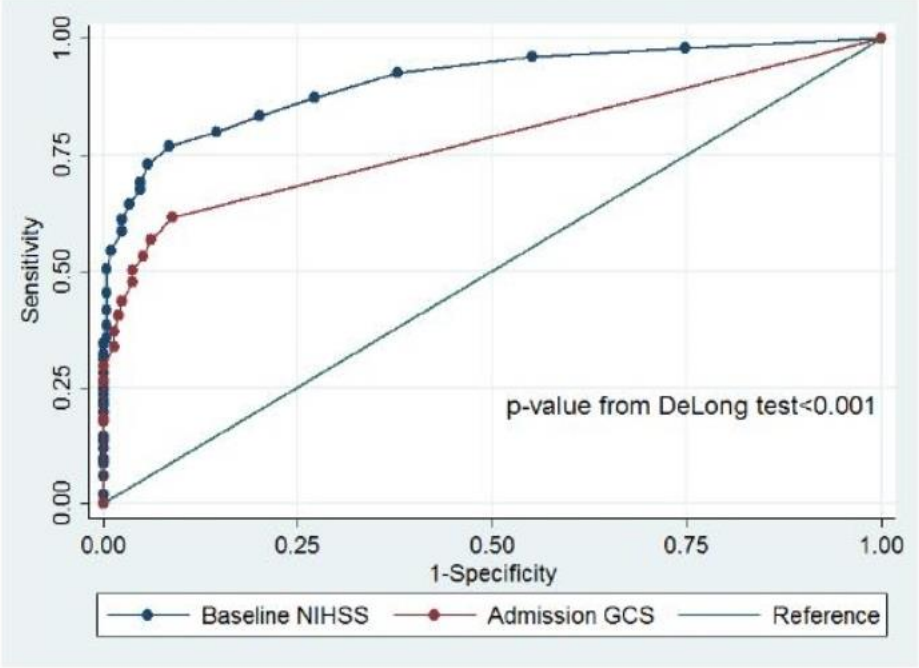
  (r -0.773; $p<0.001$)

Results

- NIHSS (c statistic: 0.91; 95%CI: 0.89-0.93) discriminated better than GCS (c statistic: 0.78; 95%CI: 0.75-0.81) for 24-hour poor functional outcome (DeLong p<0.001)

A. ROC analysis for mRS 3-6:

Predictor	AUC	95%CI
Baseline NIHSS	0.91	0.89, 0.93
Admission GCS	0.78	0.75, 0.81

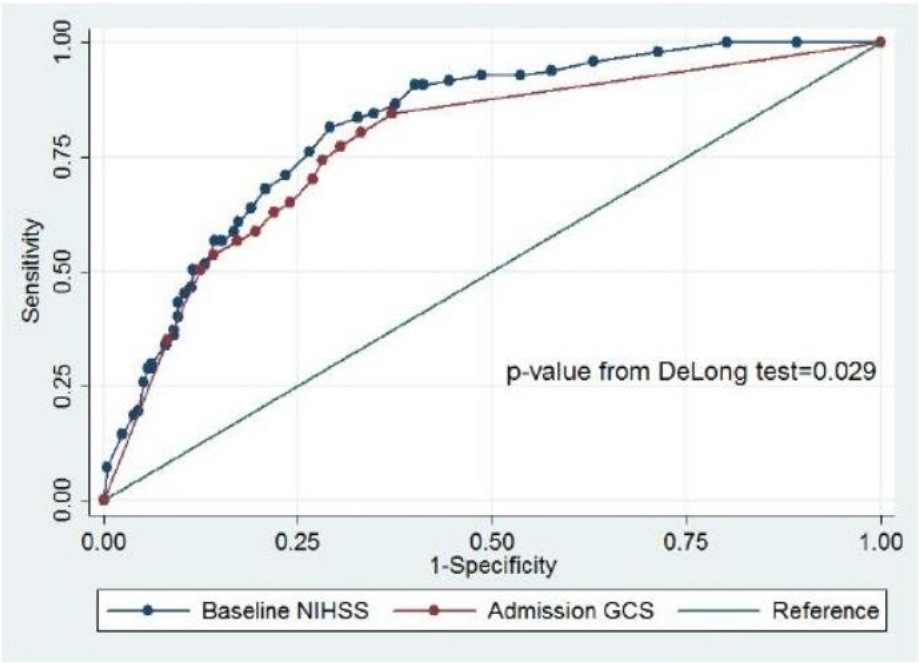


Results

- NIHSS (c statistic: 0.82; 95%CI: 0.78-0.86) also discriminated better than GCS (c statistic: 0.78; 95%CI: 0.73-0.83) for large hematoma volume (DeLong p=0.029)

B. ROC analysis for admission ICH volume >30cc:

Predictor	AUC	95%CI
Baseline NIHSS	0.82	0.78, 0.86
Admission GCS	0.78	0.73, 0.83



Conclusions

- The NIHSS has a greater discriminative power than GCS to identify patients with poor functional outcomes and large hematoma volumes.
- Use of the NIHSS as a serial assessment tool may promote an improved understanding of change in ICH neurological stability over time, enabling better earlier detection of ICH worsening, prognostication and earlier implementation of rehabilitative strategies.
- Our future research is focusing on using NIHSS for ICH serial monitoring.