

Timing of Collateral Enhancement is Associated with Clinical Outcomes

Sin Yee Foo¹, Amith Sitaram², Marta Guarisco², Keith Muir²

¹Department of Neuroradiology, Institute of Neurological Sciences, Glasgow, UK

²Institute of Neuroscience and Psychology, University of Glasgow

INTRODUCTION

Quality of collateral perfusion is associated with prognosis in anterior circulation proximal vessel occlusion. We hypothesized that timing of maximum intravascular attenuation would offer an index of collateral quality and have prognostic utility.

METHODS

From a database of acute stroke patients imaged <6h after onset with both CT angiography (CTA) and perfusion (CTP), we selected CTA-confirmed proximal M1 or ICA occlusions with retrograde collateral flow. The time of maximum attenuation in Hounsfield Units (HU) on 4D angiographic MIPs derived from CTP was measured in collateral vessels ipsilateral to the ischaemic hemisphere and referenced to time of maximal attenuation in the contralateral proximal M1 (Figure 1). We assessed the association of time to maximal collateral attenuation, dichotomized as (i) ≤ 4 seconds and (ii) > 4 seconds, and median NIHSS change, major NIHSS improvement (score ≤ 1 or improvement by ≥ 8 at 24h) and 90-day mRS scores using linear and binary logistic regression respectively, adjusted for thrombolytic treatment and 24h recanalisation status.

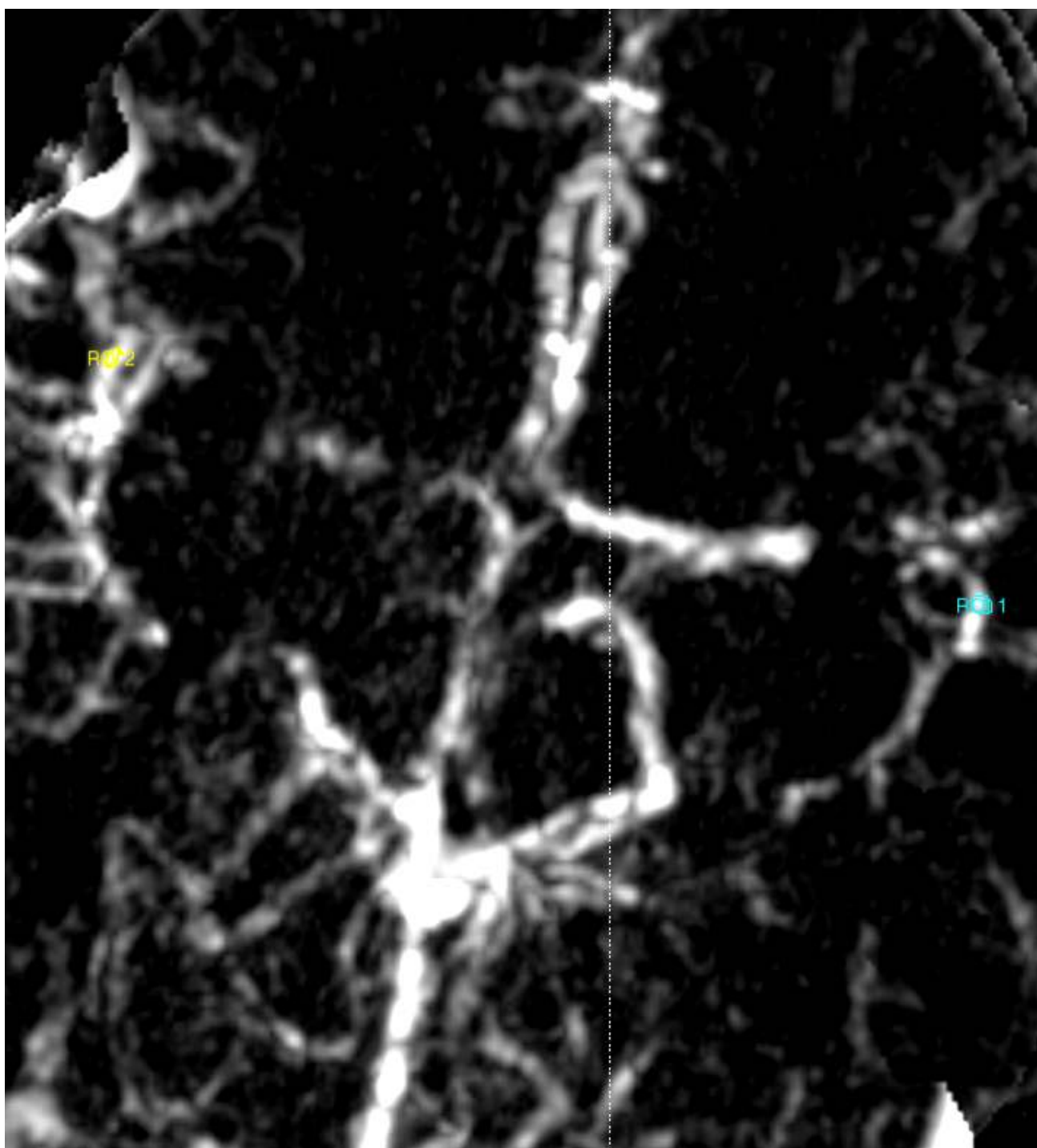


Figure 1:
Maximum attenuation on side of occlusion (Left) achieved at 18 seconds. ROI 1 = 222 HU
Maximum attenuation on unaffected side achieved at 14 seconds. ROI 2 = 273 HU

RESULTS

Thirty-eight proximal occlusions with retrograde collateral flow were included. Maximal attenuation was ≤ 4 seconds in 18/38 subjects and > 4 seconds in 20/38. Median admission NIHSS scores were 15 and 17 respectively, $p=0.6$. Time to maximal collateral attenuation was associated with median 24h NIHSS change, ($p=0.013$) and there was a trend towards association with major NIHSS improvement ($p=0.069$). No difference between groups for day 90 mRS 0-2 ($p=0.1$) or mRS 0-1 ($p=0.165$).

Figure 2: Comparison between groups in the change of NIHSS

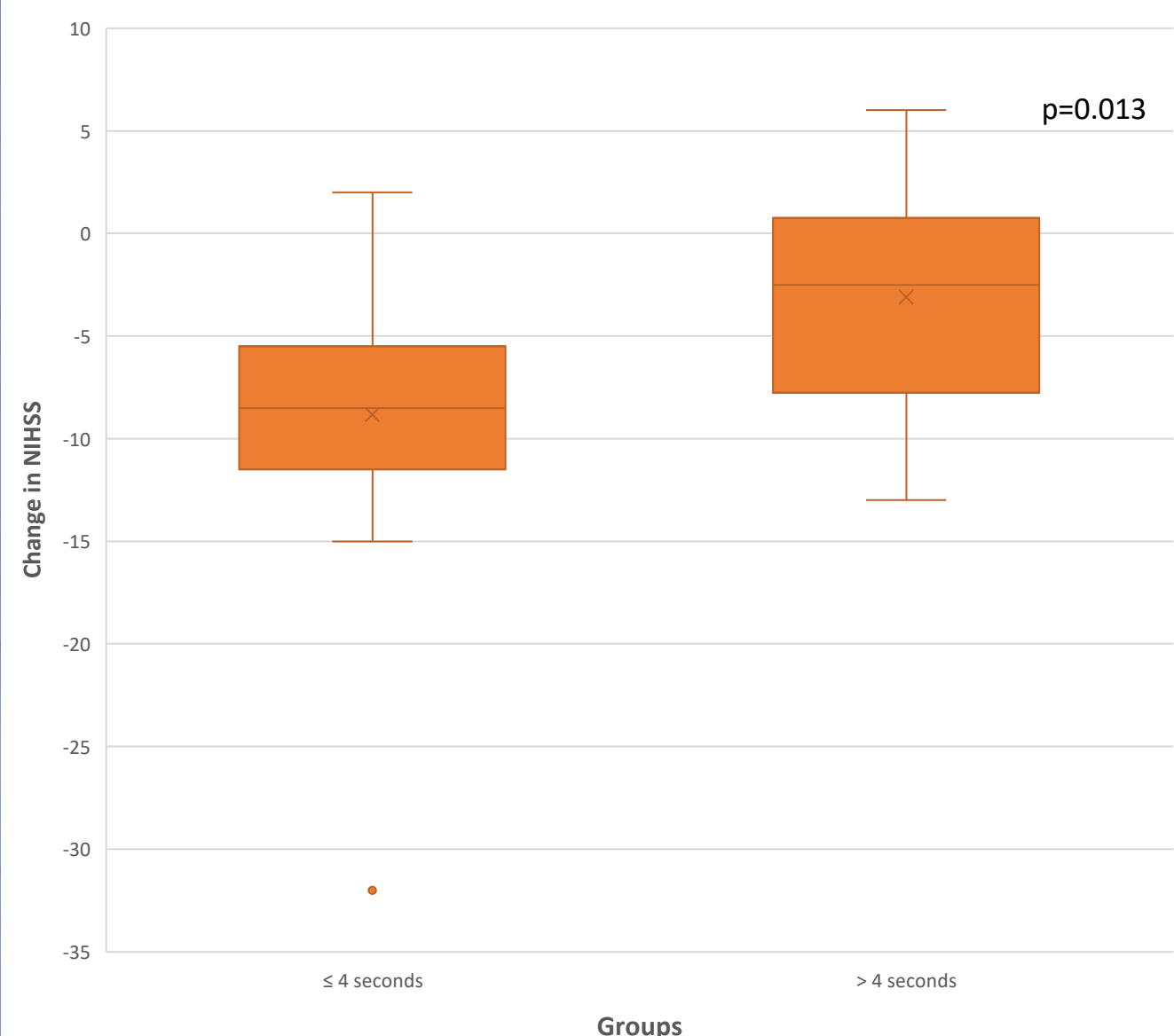
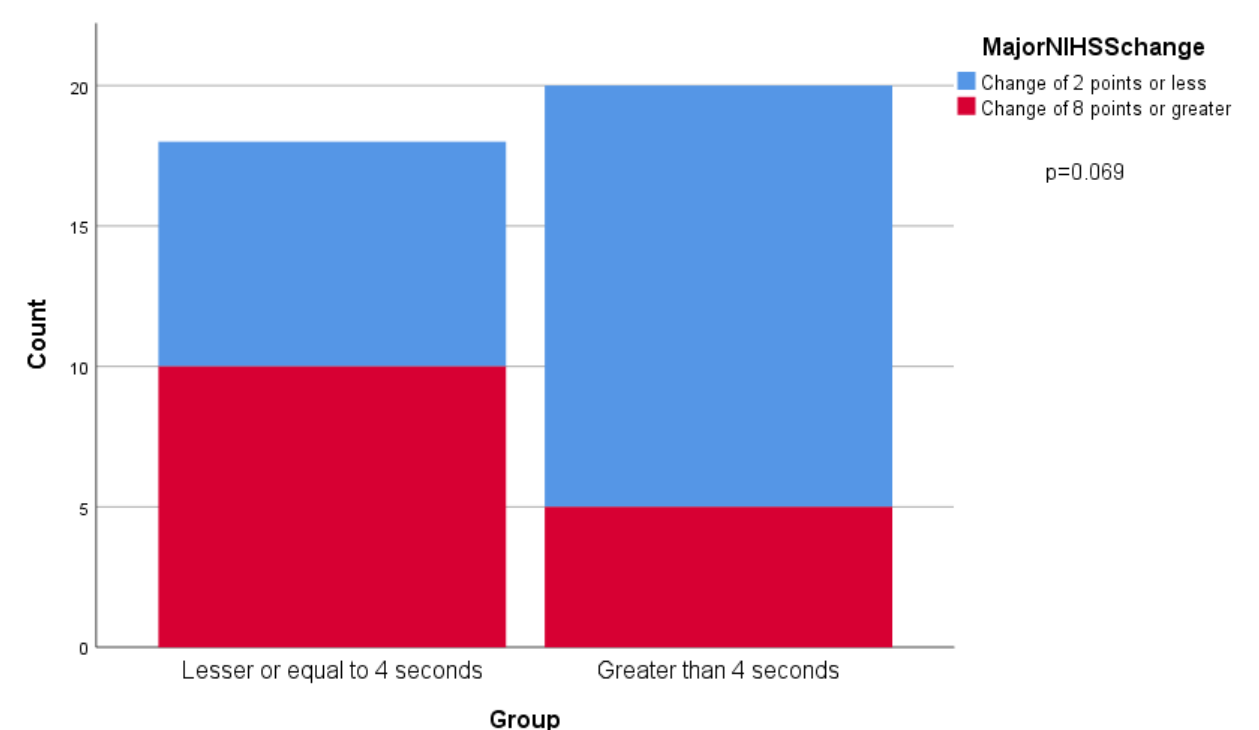


Figure 3: Relationship between time to maximum attenuation on affected side and degree of NIHSS change.



CONCLUSION

Shorter time to maximal collateral attenuation is associated with 24 hour neurological improvement and may offer an alternative index of collateral quality suitable for treatment selection.