Radiological Eye Deviation As A Predictor Of Large Vessel Occlusion In Acute Ischaemic Stroke

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Introduction

- Detection of large vessel occlusion (LVO) is required for endovascular therapy (EVT) in acute ischemic stroke (AIS)
- CT angiography (CTA) to detect LVO is not always performed at primary stroke centres
- Eye deviation detected on brain imaging is associated with improved detection of early ischemic change
- Comparison of Eye deviation on brain imaging with angiographic status have been limited
- This study sought to compare radiological eye deviation with presence / absence of LVO in a thrombolysis-treated population

Methods

- Review of consecutive AIS patients over 2 years treated with IV thrombolysis at 2 stroke centres who had admission CTA.
- Eye deviation was determined from admission CT brain blinded to CTA result, parenchymal imaging and clinical information.
- No cut-off angle of eye deviation was required (defined pragmatically as present/absent)
- Logistic regression was used to determine which factors were associated with LVO

Results

Risk Factor	Large Vessel Occlusion (N=124)	No Large Vessel Occlusion (N=71)	P value
Median (interquartile range)			
Age	72 (65-83)	71 (58-81)	0.24
NIHSS score	15 (11-20)	7 (5-10)	<0.01
Number (percentage)			
Hypertension	35 (28.2)	9 (12.7)	0.09
Diabetes	14 (11.3)	4 (5.6)	0.35
Current/ Ex-smoker	21 (16.9)	10 (14.1)	0.42
Atrial Fibrillation	20 (16.1)	7 (9.9)	0.22
Previous stroke	15 (12.1)	7 (9.9)	0.53
Congestive Cardiac Failure	5 (4.0)	1 (1.4)	0.15
Anticoagulant	6 (4.8)	4 (5.6)	0.78
Gender (Female)	60 (48.4)	22 (31.0)	0.02
Eye deviation on CT	88 (71.0)	16 (22.5)	<0.01
Clinical eye deviation (NIHSS point 2)	54 (43.5)	8 (11.3)	<0.01

Risk Factor	Odds Ratio (95% confidence Intervals)	P value
Age	1.01 (0.98-1.04)	0.37
NIHSS score	1.15 (1.08-1.23)	<0.01
Hypertension	0.907 (0.43-1.92)	0.80
Atrial Fibrillation	1.17 (0.44-3.07)	0.75
Congestive Cardiac Failure	0.42 (0.03-5.17)	0.50
Gender (Female)	1.33 (0.63-2.8)	0.45
Eye deviation on CT	5.13 (2.35-11.2)	<0.01

	NIHSS ≥ 11	Eye Deviation on CT
Sensitivity	78.5	71.0
Specificity	76.1	77.5
Positive Predictive value	84.7	84.6
Negative Predictive Value	65.3	60.4
Hyperdense artery sign as comparison Sensitivity =52.4 % Specificity 94.9 %		

Table 2: Logistic regression for factors associated with LVO

Table 3: Sensitivity and Specificity for factors associated with LVO

Table 1 : Clinical and radiological features with and without LVO

Figure 1: ROC Curve results

Clinical Eye deviation identified in 43.5% of LVO cases
Radiological eye deviation identified in 71.0 %

Poor agreement between clinical and radiological eye Deviation : Kappa =0.3 (0.17-0.44) , (may reflect poor detection / sensitivity of cortical signs in routine NIHSS examination)

Figure 2: NIHSS cut points for LVO occlusion

Figure 3: NIHSS values with and without LVO

Figure 4: A= No Eye Deviation, no occlusion on CTA
B= Eye deviation to right, right ICA and M1 occlusion
C= Eye Deviation to left, left M2 occlusion

Discussion

- 1: Conjugate Eye deviation in AIS is Associated with LVO detection on concurrent CTA
- 2: Eye Deviation had a similar predictive value to NIHSS>11
- 3: Interpretation of Radiological eye deviation is rapid and likely to be faster than that required for NIHSS
- 4: Clinical eye deviation on NIHSS was less frequent than radiological detection; improved sensitivity with lack of eye fixation?
- 4: Validation in a broader cohort of *suspected* AIS cases is needed to refine the absolute utility of eye deviation in acute decision making
- 5: Radiological eye deviation in suspected AIS should alert clinicians to the likelihood of LVO and prompt vascular imaging if not already performed