FACTORS ASSOCIATED WITH STROKE MISDIAGNOSIS IN THE EMERGENCY DEPARTMENT: A RETROSPECTIVE CASE-CONTROL STUDY

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Abstract

Background: Failure to recognise acute stroke may result in worse outcomes due to missed opportunity for acute stroke therapies.[1] Our study examines factors associated with stroke misdiagnosis in patients admitted to a large comprehensive stroke centre.

Methods: Retrospective review comparing 156 consecutive stroke patients who were initially misdiagnosed in ED with 156 randomly selected stroke controls matched for age, gender, language spoken and stroke subtype for the period 2014-2016. (figure 1)

Results: There were 141 ischemic and 15 hemorrhagic misdiagnosed strokes (median age: 77 years, M:F=1.3:1). Symptom resolution, altered mental status, nausea/vomiting, dizziness and vertigo favored misdiagnosis (p<0.05). Hemiparesis and dysarthria favored an accurate diagnosis (p<0.05). Misdiagnosed patients were more commonly triaged into a lower ED category, FAST-negative and underwent delayed CT imaging (Table 2). Misdiagnosed patients were more likely to have posterior circulation stroke (39% vs. 22%, p=0.01) and be admitted under non-neurological services (35% vs. 11%, p<0.001). Misdiagnosed patients admitted under non-neurology services had significantly worse discharge functional outcomes and higher in-hospital mortality compared to those admitted under neurology (Table 2).

Conclusions: Patients with stroke misdiagnosis commonly presented with FAST-negative and nonspecific symptoms often associated with posterior circulation stroke. Improved diagnostic accuracy may improve access to acute therapies and potentially achieve better clinical outcomes [2].

Discussion: The present study found that non-specific symptoms often associated with posterior circulation stroke, such as nausea, vomiting, dizziness and altered mental state and symptom resolution at the time of ED assessment were more commonly associated with stroke misdiagnosis (table 1).

Misdiagnosed patients were typically FAST-negative and assessed as having a less medically “urgent” condition (pertaining to a lower ED triage category) with a more prolonged time before undergoing CT brain imaging (table 2).

Posterior circulation stroke was disproportionately represented in misdiagnosed patients which is consistent with the literature [3]. This offers explanation why non-specific symptoms such as nausea, vomiting and dizziness as opposed to motor findings were more common in those misdiagnosed [4].

Misdiagnosed patients admitted under non-neurology services had worse discharge outcomes possibly due to missed opportunity for standard processes of care, for example, admission to a non-neurological ward rather than the stroke unit (table 3).

	Misdiagnosis (n=156)	Control (n=156)	p value
Altered mental status	64 (41%)	40 (26%)	0.004
LOC reduced	66 (42%)	47 (30%)	0.025
Dizziness	39 (25%)	8 (5%)	<0.0001
Hemiparesis	36 (23%)	109 (70%)	<0.0001
Syncope/collapse	27 (17%)	6 (4%)	0.0001
Headache	25 (16%)	19 (12%)	0.25
Dysarthria	24 (15%)	74 (47%)	<0.0001
Nausea and/or vomiting	23 (15%)	9 (6%)	0.009
Memory disturbance	23 (15%)	5 (3%)	<0.001
Resolved deficits at presentation	22 (14%)	11 (7%)	0.04
Vertigo	19 (12%)	6 (4%)	0.007
Visual disturbance or loss	19 (12%)	13 (8%)	0.26
Ataxia	12 (8%)	9 (6%)	0.50

Table 1. Baseline clinical features in stroke misdiagnosis patients compared to accurately diagnosed stroke controls.

Figure 1. Flow diagram showing study design with inclusion and exclusion criteria for stroke misdiagnosis.

	Misdiagnosis (n=156)	Control (n=156)	p value
Premorbid nursing home residential accommodation	27 (17%)	13 (8%)	0.02
Ambulance transport to hospital	129 (83%)	122 (78%)	0.36
FAST-negative	122 (78%)	16 (10%)	<0.0001
ED Triage Resuscitation/Emergency category	51 (33%)	91 (58%)	<0.0001
Mean time to first ED physician contact (minutes)±SD	91±82	61±70	0.001
Median time to CT (minutes) [Interquartile range]	250 309	108 161	<0.0001
Admitted under neurology service	101 (65%)	139 (89%)	<0.0001
Mortality at discharge	12 (8%)	16 (10%)	0.43
Discharge modified Rankin Scale score ≥3	85 (54%)	88 (56%)	0.73

Table 2. Comparative emergency department and outcome data between misdiagnosed patients and accurately diagnosed stroke controls.

(n=156)	Neurology service	Non-neurology service	p-value
Patients	55	101	
Pre-morbid MRS ≥3	16 (16%)	26 (47%)	<0.0001
Discharge MRS ≥3	41 (41%)	44 (80%)	<0.0001 ¥
Mortality ¥	4 (4%)	8 (15%)	0.02 ¥

* MRS = Modified Rankin Score
¥ p-values significant < 0.05 when adjusting for pre-morbid MRS

Table 3 - Outcome measures of misdiagnosed patients in terms of admitting service

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