



A negative DWI MRI within 48 hours of stroke symptoms ruled out anterior circulation stroke

Clinical Problem: A 68 year old man presents with 3 hrs of confusion and left hemiplegia. An urgent MRI is ordered.

Clinical Question: What is the sensitivity and specificity of MRI in diagnosing acute stroke?

Search Strategy:

SUMSearch:

- “Diffusion weighted and stroke” Result: 5 Pubmed searches (eg. DIFFUSION WEIGHTED [MeSH Terms] OR (DIFFUSION [WORD] AND WEIGHTED [WORD])) AND (STROKE [MeSH Terms] OR (STROKE [WORD])) AND (1950:2002[DP] AND English [Language]) yielded 23 articles (‘Diffusion weighted’ not a MeSH term). Articles 1 and 2 identified.
- “MRI and stroke” Result: 5 pubmed searches (eg. MRI [MeSH Terms] OR (MRI [WORD])) AND (STROKE [MeSH Terms] OR (STROKE [WORD])) AND (1950:2002[DP] AND English [Language]) yielded 113 articles. Articles 1 and 2 identified.

Article 3 found through hand-searching of other articles (not in the references of article 1 or 2).

Clinical Bottom Lines:

1. The sensitivity of DWI in anterior circulation stroke within 48 hours is 98% (122/130) (95%CI; 95,100).
2. The sensitivity for posterior circulation strokes is only 68.4% (13/19) (95%CI 45, 90) within 24 hrs and 80.6% (25/31) (95%CI 66, 94) within 48 hrs.
3. An earlier systematic review found a lack of valid studies that assessed sensitivity or specificity of diffusion or perfusion imaging in acute ischemic stroke.
4. The role of diffusion or perfusion MRI in assessing t-PA candidacy has not been studied.

The Evidence:

- 1) A blinded, retrospective study of DWI and flair MRI was performed in 139 patients presenting with persistent stroke-like signs/symptoms within 48 hrs of their onset. The gold standard for an acute stroke was the clinical diagnosis, which was largely based on follow-up MRI (see comments).
- 2) A systematic review of diffusion or perfusion MRI in acute ischemic stroke
- 3) A study comparing CT to MRI in the hyper-acute stage for suspected hemispheric infarct within 6 hours.

Data:

Overall, 8 false negatives of 130 were seen with DWI alone. Two of 99 were anterior circulation lesions, giving a high sensitivity (98%; CI 95-100) for strokes of this type. Posterior circulation strokes were missed in 6 of 31 cases for a sensitivity of 80.6% (CI 66-94). These false negative lesions on follow-up scans were found to be significantly smaller (0.18 cm^3 vs. 0.6 cm^3) and thought to be beyond the spatial resolution of DWI in the acute setting. Positive FLAIR sequences (which have greater resolution) were seen in 4 of the false-negative initial DWI cases within 24 hours. (1 anterior, 3 posterior circulation).

Data about the 9 non-stroke diagnoses were not explicitly stated (i.e., false positives and true negatives). Thus, 2 x 2 tables cannot be constructed and **specificity cannot** be calculated.

Article 1 better addressed our clinical question with larger “N” and using broader inclusion criteria. However, DWI imaging in article 3 had a 100% sensitivity (16/16 cases) compared with CT sensitivity at 75% (12/16 cases).

Comments:

1. The systematic review utilized sound methodology to identify and appraise 84 studies regarding DWI and/or Perfusion imaging (PI) and ischemic stroke. Unfortunately, firm conclusions could not be reached due to significant shortcomings in these studies.
2. Concerns were raised about using the MRI both as the diagnostic procedure being evaluated and as the gold

standard. The gold standard is often based on the entire clinical impression. This included the follow-up MRI, which is a test of **subacute or chronic** rather than acute infarct. This may ameliorate the concern raised above, but may raise the issue of dealing with different conditions (acute versus subacute/chronic).

Reference:

1. [Oppenheim C, Stanescu S et al. False-negative diffusion-weighted MR findings in acute ischemic stroke. *AJNR* \(2000\) 21: 1434-1440](#)
2. [Keir SL, and Wardlaw JM. Systematic review of diffusion and perfusion imaging in acute ischemic stroke. *Stroke* \(2000\) 31: 2723-2731.](#)
3. [Barber PA, Darby DG et al. Identification of major ischemic change: diffusion-weighted imaging versus computed tomography. *Stroke*. 1999;30:2059-2065.](#)

Key Words: [stroke, diffusion-weighted imaging, diagnosis](#)

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Date Appraised: [June 2001](#)

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