

# Value of MRI in paediatric closed head injury

**Savvas Andronikou**  
*MB BCh, FCRad (SA), FRCR (Lond)*

**Rudolf Boeddinghaus**  
*MB ChB*

**Chris J Welman**  
*MB ChB, FCRad (SA)*

*Department of Paediatric Radiology  
 Red Cross Children's Hospital  
 Cape Town*

## Abstract

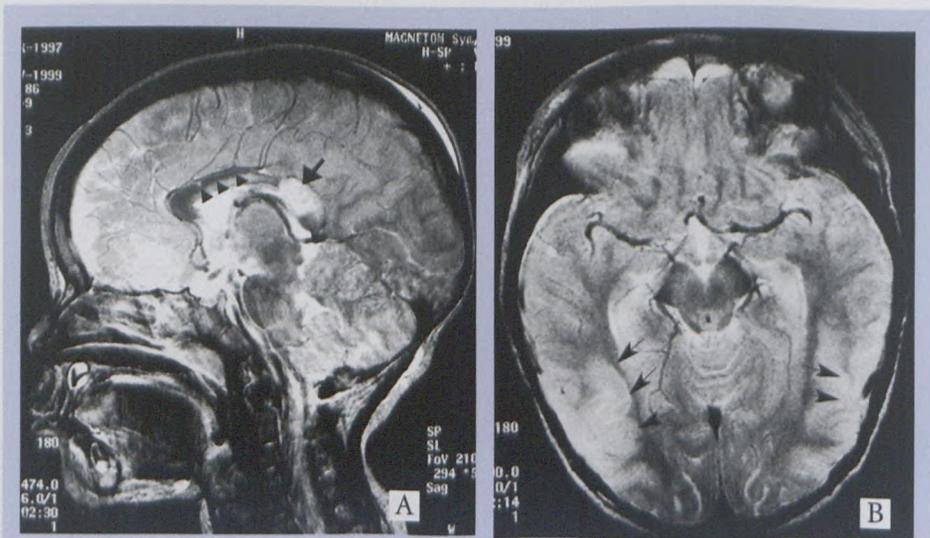
Children (and less commonly adults) with a low level of consciousness following acute head injury who have a normal CT scan are often assumed to have diffuse axonal injury of the brain. MRI may be appropriate in the subacute setting as it may demonstrate findings highly suggestive of such injury, as well as other findings not identified on CT. These findings may aid clinicians in determining prognosis. We demonstrate typical findings on various MR sequences using an index case.

A 2-year-old boy presented with a depressed level of consciousness (GCS 8/11) following a motor vehicle accident. The CT scan performed within 6 hours showed only a small subarachnoid haemorrhage, with intraventricular extension. He remained

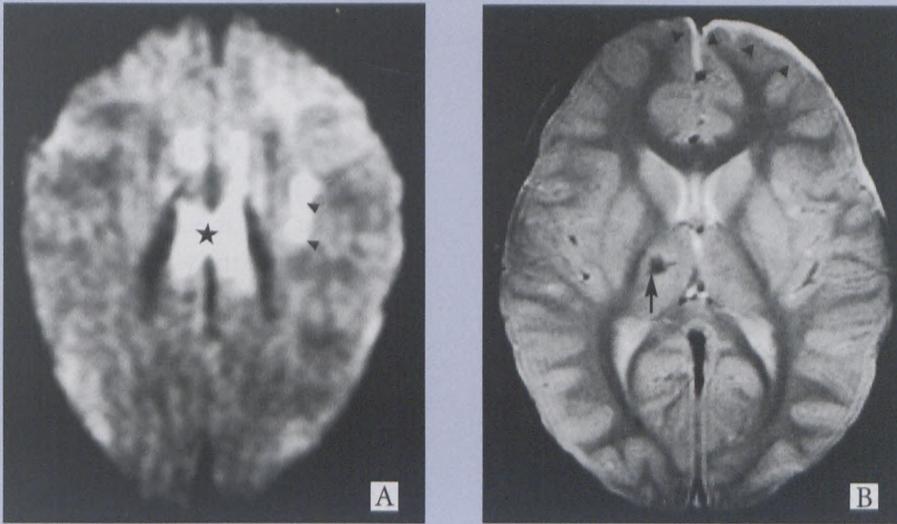
comatose, and MRI was performed after 5 days. The T2-weighted images (Figs 1a and 1b) showed high signal intensity in the splenium of the corpus callosum, at the insular grey-white interface on the left, in both temporo-occipital regions and in the right thalamus. It also demonstrated small bifrontal subdural collections, larger on the left. Diffusion-weighted images (Fig. 2a) demonstrated increased signal (restricted diffusion) in all of the same sites, except the right thalamus. On long-TR gradient-echo (Fig. 2b), the right thalamus showed marked hypointensity in keeping with blood breakdown products. On the basis of these findings, diffuse axonal

injury, non-haemorrhagic cortical contusions, small bifrontal subdural collections and a right thalamic haemorrhage were diagnosed. None of these was evident at CT. The patient's level of consciousness improved gradually, but he had residual right hemiparesis.

Shearing injuries are common in infants and young children, because the unmyelinated brain is less rigid and the subarachnoid spaces are large.<sup>1</sup> In the subacute phase, MR imaging is more sensitive than CT in detecting traumatic brain injury, such as diffuse axonal injury (DAI), non-haemorrhagic cortical contusions, haemorrhage and surface collections.<sup>1,2</sup> In DAI, T2-hyperintensity is found in typical locations (the corpus callosum, particularly the splenium and posterior body, the dorsolateral rostral brainstem, and hemispheric grey-white interfaces).<sup>3</sup> Gradient-echo images are particularly helpful in demonstrating small petechial haem-



*Figs 1a and b. Conventional T2-weighted imaging. (a) Sagittal T2W MRI demonstrates focal high-signal lesion in the splenium of the corpus callosum (arrow) and diffuse high signal intensity throughout the body of the corpus callosum (arrowheads). The sagittal is superior to the axial plane in showing corpus callosum abnormalities. These features are characteristic of DAI. (b) Axial T2W MRI shows ill-defined bilateral occipito-temporal high-signal cortical lesions (arrows) in keeping with non-haemorrhagic contusions. They were not evident on CT.*



Figs 2a and b. Special MR techniques. (a) Diffusion-weighted image demonstrates high signal over the corpus callosum (star) and at the left insular grey-white interface (arrowheads) in keeping with cytotoxic oedema. These locations are characteristic of DAI. (b) Long-TR gradient echo axial image clearly demonstrates the low signal of blood breakdown products in the right thalamus (arrow). Also demonstrated are bilateral frontal subdural collections (arrowheads) that were not shown on CT.

orrhages associated with DAI, with signal blooming, due to magnetic susceptibility effects.<sup>1,2</sup> Diffusion-weighted MRI has a role to play in distinguishing cytotoxic oedema (in DAI) from vasogenic oedema (brain swelling).<sup>2</sup> In our patient, all the above sequences showed abnormalities, which were not evident at CT. MRI is an important prognostic tool in paediatric head injury.

## References

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