The reversal sign

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DESCRIPTION

A 75-year-old man with a history of chronic obstructive pulmonary disease was found in cardiopulmonary arrest. After successful resuscitation the patient was transferred to our institution. On arrival, a non-enhanced brain CT was performed to assess brain damage, which showed signs of diffuse cerebral oedema, with effacement of the cerebral sulci, sulcal hyperdensity and decreased attenuation of deep and cortical grey matter which appears hypodense in comparison to the white matter, a finding referred to as the 'reversal sign' (figures 1 and 2). These injuries were secondary to global brain ischaemia. In less than 8 h, the patient developed multiple organ dysfunction syndrome and was pronounced dead.

Cardiopulmonary arrest may lead to diffuse hypoxic ischaemic brain injury. Initially, unenhanced brain CT may show subtle hypodensity of the basal ganglia and insular cortex, with effacement of the basal cisterns. When diffuse brain oedema develops, the findings become more obvious, with effacement of the sulci and cisterns, and loss of the grey matter–white matter differentiation. The features of the so-called reversal sign are diffusely decreased density of cerebral cortical grey matter relative to adjacent white matter, which appears hyperdense, resulting in inversion of the normal attenuation relationship between grey and white matter.^{1 2} This, may or may not coexist with an increased attenuation of the thalami, brainstem and cerebellum, also known as preservation of central structures.²

Figure 1 Axial unenhanced CT showing effacement of the sulci and deep grey matter hypodensity. Notice the loss of cortical grey matter–white matter differentiation, with inversion of the normal attenuation pattern, the so-called reversal sign.

Figure 2 Coronal reformatted image of the same patient showing the reversal sign, which is also present in the cerebellum.

The reversal sign reflects a diffuse hypoxic ischaemic cerebral injury, with irreversible brain damage, which carries a poor prognosis.^{1 3}

Learning points

- ▶ Many different conditions may lead to hypoxic ischaemic brain injury in children and adults.
- ▶ Loss of the grey matter–white matter differentiation is a frequent finding in patients with diffuse brain oedema, but sometimes the decreased density of the cortical and deep grey matter with inversion of the normal attenuation pattern of the brain, might give a wrong impression of normality.
- ▶ Reversal sign is associated with severe and irreversible brain damage, which carries a poor prognosis.

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