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Preferential Perfusion to The Posterior Circulation in Hypoxia

Running head: preferential perfusion in hypoxia

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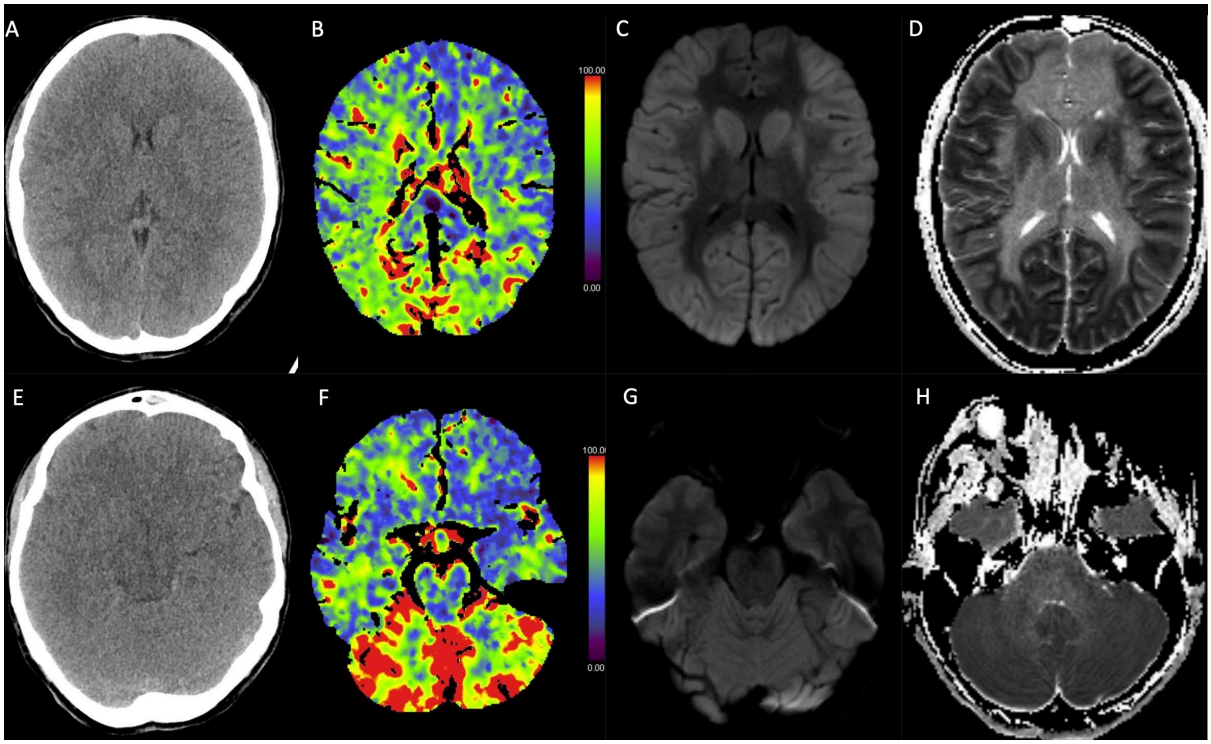

Figure 1 Nonenhanced computed tomography (NECT) (A and E), CBF (B and F), DWI (C and G) and ADC (D and H) at the level of the basal ganglia (upper row) and of the cerebellum (lower row). NECT, obtained directly after resuscitation, shows diffuse effacement of the sulci, but the gray-white matter differentiation, as well as the differentiation of the basal ganglia, can still be seen. CBF shows global perfusion reduction of the gray matter (cortex and basal ganglia), but the perfusion of the cerebellum is preserved. DWI and ADC obtained 2 days after resuscitation showing diffuse restricted diffusion in the cortex and basal ganglia.

Neuroimaging plays an important role in evaluating patients after cardiac arrest. CT is frequently used due to its wide availability and is preferred over MRI for examining intubated patients. However, CT has limited sensitivity for the detection of early brain damage.

CT may show diffuse cerebral edema, loss of gray-white matter differentiation, decreased deep gray matter attenuation, and reversal signs, such as white cerebellum sign. [1,2] This sign appears as increased attenuation of the cerebellum relative to the edematous supratentorial brain. Its presence reflects severe injury and indicates a poor prognosis. [2,3] Various theories have been proposed to explain the pathophysiology of this sign, including

increased capillary proliferation induced by hypoxia; petechial hemorrhage; transtentorial herniation that causes central preservation of perfusion; distension of the medullary veins as a result of increased intracranial pressure; or preferential flow to the posterior circulation. [2 3]

We encountered a case of a 21-year-old female who was resuscitated after strangulation in a suicide attempt. The patient underwent CT with CT perfusion an hour after resuscitation. Non-enhanced CT showed diffuse brain swelling with effacement of the sulci, but the differentiation between the gray and white matter as well as the basal ganglia was preserved. CT perfusion, however, showed diffuse CBF and CBV reduction in the cortex, and basal ganglia while the perfusion to the cerebellum was preserved (Figure 1).
After 24 hours in intensive care under a normothermia protocol, the patient had not regained consciousness and brainstem reflexes were absent. Serial EEG showed myoclonic status epilepticus. Two days after resuscitation DWI showed alterations typical of severe hypoxic-ischemic injury (Figure 1). [4] The patient died on the third day.

The pattern, in this case, is very similar to the poor-prognostic indicator “white cerebellum sign” in the non-enhanced CT. [2] This supports the theory of redistribution of blood which occurs during anoxia, with preferential supply to the posterior circulation. [2 1]

Except for edema, no other signs of hypoxic-ischemic encephalopathy were visible on the NECT, though the perfusion reversal was seen early on in this phase, suggesting that this sign most probably developed earlier than the classical signs of hypoxia on CT. To the best of our knowledge, this perfusion pattern has not been described before. Further studies are

needed to investigate the usefulness of this sign to predict patient outcome after resuscitation.

Potential Conflicts of Interest:

Nothing to report.

Author contributions:

All authors contributed to the conception and design of the study; the acquisition and analysis of data; and drafting the text and preparing the figure.

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