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CT perfusion illustrated reversal of uncal herniation after placement of an external ventricular drain

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ABSTRACT

Compression of the PCA in the context of uncal herniation is usually deducted in retrospect only with presence of a demarcated infarction in the respective territory. In this particular case with early recovery of oculomotor nerve function after CSF drainage, additional CT perfusion was able to directly document both significant compromise of the PCA as well as effective reversal of uncal herniation with restitution of perfusion within the PCA territory.

1. Introduction

Raised intracranial pressure may lead to neurological deterioration and ultimately uncal herniation [1]. Compromise of the oculomotor nerve as well as the posterior cerebral artery (PCA) running alongside the tentorial edge are well known sequelae, but are usually deducted either indirectly or observed in necropsy studies [2]. Clinical signs may progress rapidly from hemiparesis to mydriasis and coma, typically requiring immediate intervention and prohibiting morphological verification. Consequently, direct and illustrative evidence of this pathomechanism is largely lacking.

2. Case report

We present a case of a 70 year old female patient with a ruptured anterior communicating artery aneurysm. The initial GCS was 14, Hunt and Hess grade II and Fisher grade III. The patient was too good to have received an EVD in the first place at day 1. The aneurysm was secured surgically, and the immediate postoperative course was uneventful with neurological recovery and normal daily transcranial doppler measurements. On postoperative day 5, the patient was not following commands and within minutes declined to a GCS of 4 with a fixed and dilated pupil on the left. After emergency intubation a mannitol bolus was given to no avail. CT showed imminent uncal herniation on the left due to generalized edema and mild hydrocephalus, but no ischemia; interestingly, CT perfusion revealed new hypoperfusion exclusively within the left PCA territory (Fig. 1). The anisocoria was a symptom of intracranial hypertension which resolved after the causal treatment with CSF drainage, so that decompressive hemicraniectomy was not further needed. An external ventricular drain was placed with an opening pressure of 35 mmHg. After gradual CSF drainage, CT and CT perfusion were repeated approximately 20mins later. Again, no ischemia was seen, but perfusion was restored within the PCA territory. Isocoria was established within 45 min after EVD placement and subsequent neurological improvement without evidence of new deficits was observed.

3. Conclusion

In this particular case with early recovery of oculomotor nerve function after CSF drainage, additional CT perfusion was able to directly document both significant compromise of the PCA as well as effective reversal of uncal herniation with restitution of perfusion within the PCA territory.

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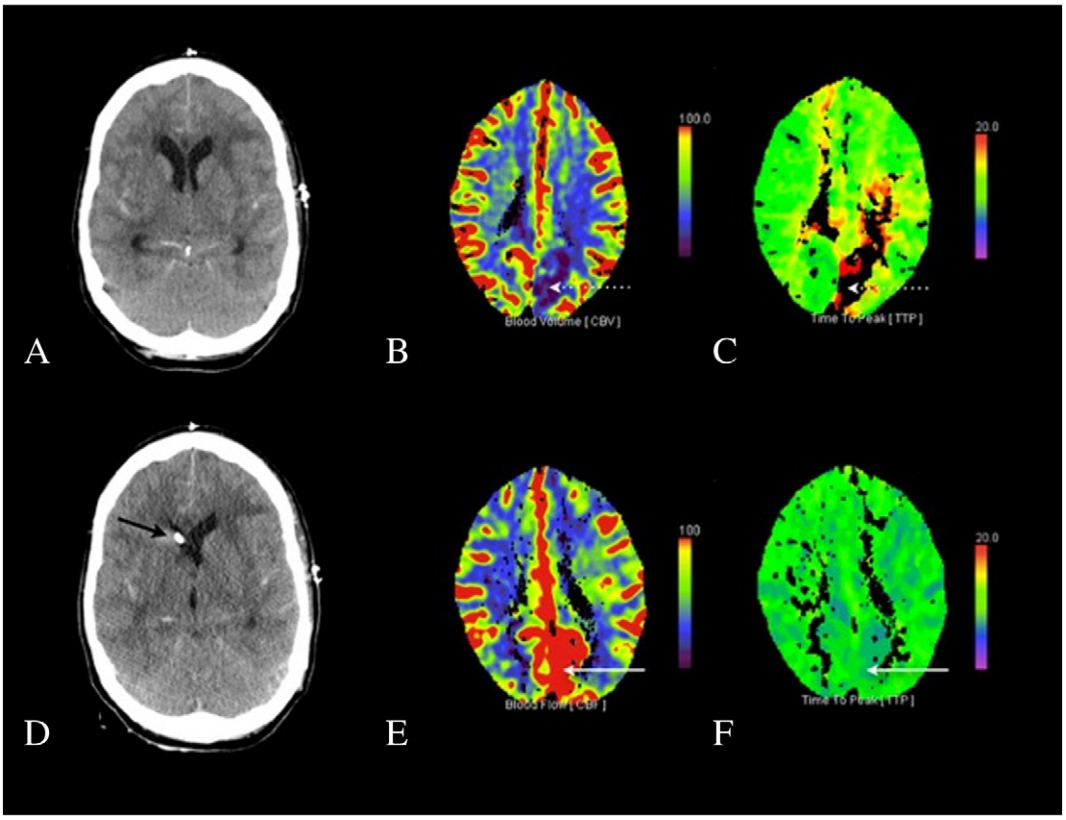

Fig. 1. Initial CT scan showed generalized edema and mild hydrozephalus (A), with hypoperfusion on cerebral blood flow (CBF) and time-to-peak (TTP) maps (B, C) within the left PCA territory (white dotted arrow); after EVD placement and drainage (D, black arrow), perfusion was restored within the respective territory (F, G: white arrows), indicating sufficient release of the left PCA along the tentorial edge.