

Short communication

Stroke vs. status epilepticus. A case report utilizing CT perfusion

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Abstract

Strokes and seizures have varied presentations and their differentiation may be challenging for both primary care physicians and neurologists. We present a case of a patient evaluated for acute ischemic stroke. Status epilepticus was eventually diagnosed by utilizing CT-perfusion study and EEG.

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1. Introduction

Strokes and seizures have varied presentations and their differentiation may be challenging for both primary care physicians and neurologists. Patients in non-convulsive status epilepticus or post-ictal Todd paralysis may present similar to ischemic stroke. Seizures may also be a presenting symptom of acute cerebral ischemia [1]. Currently, FDA approved treatment for acute ischemic stroke is an IV tissue plasminogen activator (t-PA) within 3 h of symptom onset [2]. This treatment carries significant risk of hemorrhagic complications [3]. Negative head CT scan without contrast is one key study required prior to initiating treatment. However, this study fails to identify potentially misdiagnosed seizure patients. Whereas hypoperfusion related to strokes has been widely investigated by CT-perfusion imaging [4,5], information on signs of brain tissue hyperperfusion such as short mean transient time, increased cerebral blood flow and cerebral blood volume is lacking.

2. Case report

A man, aged 64 years was admitted to the hospital with sudden onset left hemiparesis and slurred speech. His clinical status progressively worsened over the course of several hours. He had a history of right hemispheric stroke 2 years prior with excellent recovery. There was no history of seizures, either remote or acute. Risk factors included hypertension, and dyslipidemia, both controlled with medications, and a history of coronary artery disease. His wife reported occasional cigar smoking and several alcoholic drinks daily.

NIH Stroke Scale on admission was 8 for facial droop, severe dysarthria, and moderate left hemiparesis. Presentation was within 3 h of symptom onset and was triaged to potential IV thrombolytic therapy. CT scan of the brain without contrast did not show hemorrhage or early signs of acute stroke. There was a right fronto-parietal hypodensity consistent with chronic infarct. CT-angiogram was unremarkable. CT-perfusion study demonstrated a small area of short mean transit time (MTT), increased cerebral blood volume (CBV) and increased cerebral blood flow (CBF) in the right fronto-parietal territory (Fig. 1). These findings were interpreted as either hyperperfusion from epileptiform activity or reperfusion following spontaneous recanalization. Bedside EEG demonstrated ongoing periodic lateralized epileptiform discharges (PLEDs) originating in the territory corresponding to the old stroke. He was loaded with

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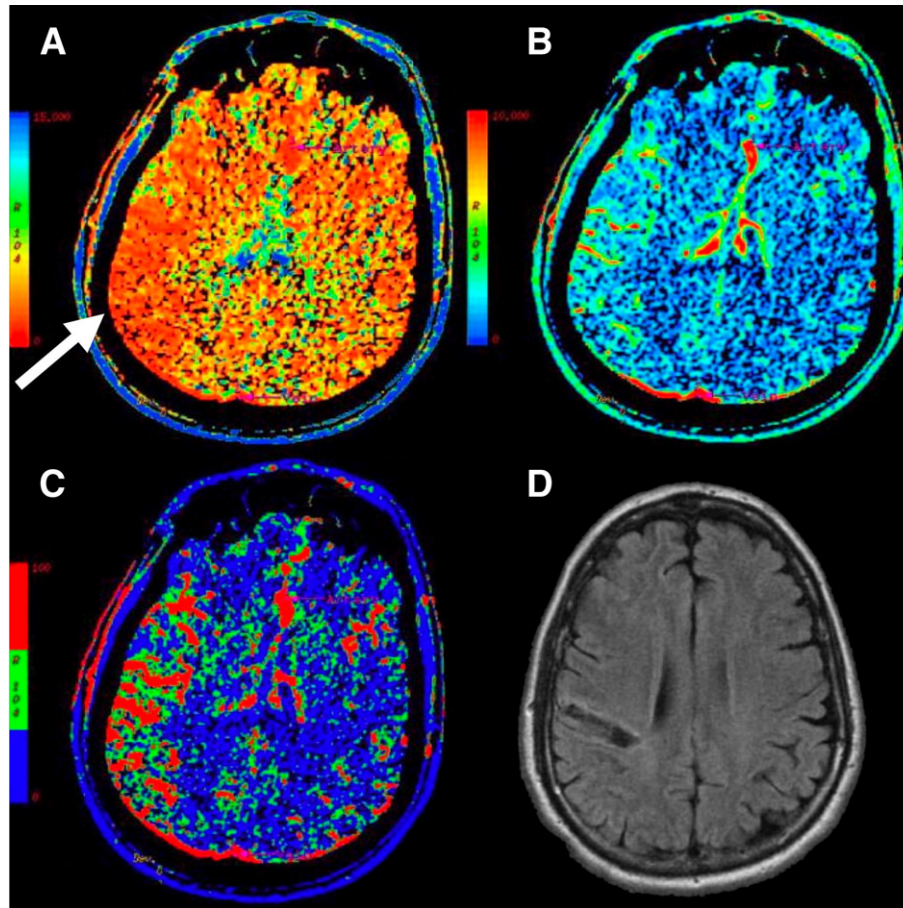


Fig. 1. CT-perfusion study demonstrating (A) shortened mean transit time in the right fronto-parietal area (arrow). Corresponding area of increased cerebral blood volume (B), and increased cerebral blood flow (C). (D) MRI FLAIR-sequence demonstrates chronic right frontal infarct.

phenytoin and subsequently improved to baseline. Diffusion weighted imaging revealed no evidence of an acute ischemic process.

3. Discussion

Cerebral angiography and more recently SPECT and f-MRI have shown ictal hyperperfusion/hypermetabolism in patients with focal epilepsy [6,7]. In this report, ictal hyperperfusion was demonstrated on CT-perfusion study. This modality has several advantages including quantitative results, short acquisition time, and routine availability providing a complementary approach in the acute diagnosis and management of seizure patients.

This report also strengthens the argument for more complete CT studies in assessing acute stroke patients for thrombolytic therapy. Individuals with ongoing non-convulsive seizures or post-ictal Todd paralysis whose presentation may mimic a stroke might be unnecessarily exposed to t-PA treatment. Current guidelines do not require a more extensive diagnostic work up. However, in this case, CT-perfusion study changed the initial diagnostic impression and eventual management.

A primary indication for CT-perfusion study in the work-up of presumed ischemic stroke is the ability to demonstrate infarcted brain tissue and ischemic brain tissue at risk. A recent prospective multicenter study on 130 acute stroke patients investigated such perfusion parameters as MTT, CBF and CBV [4]. In comparing the results of CT-perfusion with MR diffusion-weighted imaging/fluid-attenuated inversion recovery (DWI/FLAIR) to delineate eventual size of brain infarct, it was concluded that utilizing relative MTT and absolute CBV may be an optimal approach in defining areas of infarct and penumbra in acute stroke. Notably, adding CT-perfusion in facilities with standard protocols prolongs most imaging and interpretation by only 15 min.

Differential diagnosis in this case includes acute ischemic stroke shown to be accompanied by variety of electrical epileptic activities not uncommonly [8]. Such features of ischemic brain as enhanced release of excitotoxic glutamate, ionic imbalances, breakdown of membrane phospholipids, and release of free fatty acids all may contribute to abnormal neuronal discharge [9]. However, we found signs of hyperperfusion in yet symptomatic patient. One can speculate that hyperperfusion may indicate

recanalization and should correlate with clinical improvement. Furthermore our patient improved after phenytoin treatment while his EEG normalized as well.

As we mentioned ictal hyperperfusion has been documented. To our knowledge CT-perfusion studies have not been routinely used along with EEG in the management of acute stroke thus it is unknown whether or not non-ictal PLEDs correlate with hyperperfusion.

In summary, CT-perfusion is a reliable investigation for cerebral hemodynamics, helpful in assessment of ischemic brain, and may assist in differentiating unusual presentations of seizures from ischemic stroke.

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