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ORIGINAL ARTICLE

Postictal deficit mimicking stroke: Role of perfusion CT

Déficit post-ictal simulant un accident vasculaire cérébral : place du scanner de perfusion

K. Masterson*, **M.I. Vargas, J. Delavelle**

Unit of Neuroradiology, Department of Radiology, DISIM, Geneva University Hospital and University of Geneva, 24, rue Micheli-du-Crest, 1211 Geneva, Switzerland

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KEYWORDS
Epilepsy;
Perfusion CT;
Stroke;
Thrombolytic therapy

Summary
Objectives. — To demonstrate the use of perfusion CT in patients presenting with a suspected diagnosis of stroke to avoid the administration of inappropriate thrombolytic therapy in stroke-mimicking conditions such as status epilepticus.
Material and methods. — We reviewed the imaging studies of four patients presenting with symptoms suggestive of stroke, but finally diagnosed with status epilepticus. Imaging was by a 16-section multidetector CT scanner using a protocol consisting of non-contrast CT, CT angiography and perfusion CT. Color-coded maps allowed calculation of the CBV (cerebral blood volume), CBF (cerebral blood flow) and MTT (mean transit time).
Results. — In all four cases, perfusion CT revealed increases in CBF and CBV as well as a decreased MTT, consistent with hyperperfusion linked to status epilepticus with focal deficit—in contrast to the hypoperfusion observed in stroke patients.
Conclusion. — The use of perfusion CT accurately detected hyperperfusion in status epilepticus presenting as stroke. In such cases, perfusion CT imaging avoided the administration of potentially harmful thrombolytic therapy to patients experiencing seizures due to different underlying etiologies.

MOTS CLÉS
Épilepsie ;
Scanner ;
Perfusion ;
Ischémie ;
Thrombolyse

Résumé
Objectifs. — Illustrer l'utilité du scanner de perfusion dans le cadre de l'urgence afin d'éviter de thrombolyser les patients présentant un déficit neurologique lié à une crise d'épilepsie.
Matériels et méthodes. — Les dossiers radiologiques de quatre patients se présentant avec un état de mal épileptique mais dont les symptômes suggéraient une ischémie ont été revus. Nous avons examiné ces patients avec un scanner 16 barrettes. Le protocole utilisé comprenait un scanner sans injection, un scanner de perfusion, un angioscanner et des coupes

* Corresponding author.
E-mail address: karen.masterson@hcuge.ch (K. Masterson).

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parenchymateuses tardives. Les cartographies de perfusion (débit sanguin cérébral [DSC], volume sanguin cérébral [VSC] et temps de transit moyen [MTT]) ont été calculées.
Résultats. — Dans les quatre cas, les cartographies de perfusion ont montré une augmentation du DSC et du VSC et une diminution du MTT témoignant d'une hyperperfusion dans le cadre d'un état de mal épileptique avec déficit neurologique alors que les données des cartographies auraient révélé une hypoperfusion en cas d'accident cérébral ischémique.
Conclusion. — L'état de mal épileptique mimant un accident vasculaire cérébral peut être diagnostiqué grâce au scanner de perfusion, évitant l'administration potentiellement dangereuse et non indiquée d'agents thrombolytiques.

Introduction

Stroke diagnosis can be clinically difficult [1,2]. Conditions that mimic stroke can account for up to one-fifth of patients [1] and, in acute settings, only imaging can help to make the correct diagnosis. In emergency cases, reperfusion therapy relies on non-enhanced CT (NECT) [1] to exclude hemorrhage, an absolute contraindication for thrombolysis. Thrombolytic therapy has been associated with hemorrhagic complications that can be potentially harmful in patients with stroke-mimicking conditions [3]. Our aim was to establish the importance of using perfusion CT (P-CT) in the radiological evaluation of stroke to avoid misdiagnosing and mistreating non-stroke patients with thrombolytic therapy, especially patients with epilepsy.

Material and methods

Imaging protocol

At our hospital, all patients with a suspected diagnosis of stroke seen within 3 hours of symptom onset undergo, without delay, a NECT scan followed by P-CT and CT angiography (CTA), using a multidetector row CT scanner (Philips MX 8000 16-section multidetector CT scanner). NECT of the brain is performed using sequential 3-mm-thick sections. P-CT images are acquired during the infusion of 40 mL of a contrast agent (Accupaque 300) at a rate of 5 mL/sec, covering the region of the basal ganglia with a *z*-axis coverage of 24 mm. CTA is performed from the aortic arch to the vertex with a slice thickness of 1.5 mm after infusion of 100 mL of contrast agent at 4 mL/sec. Using the commercial software MxView V5.0 (Philips Medical Systems), color-coded maps allow the cerebral blood volume (CBV), cerebral blood flow (CBF) and mean transit time (MTT) to be calculated.

Imaging analysis

The NECT images were examined for early signs of infarction or hemorrhage. Perfusion CT images were post-processed, and the CBF, CBV and MTT calculated and compared with those of the contralateral hemisphere. Finally, CTA images were analyzed using maximum-intensity projection (MIP) reconstruction and multiplanar reconstruction (MPR) techniques. In this study, the radiologists were not blinded to the patient's diagnosis when reviewing the images.

Electroencephalography (EEG)

EEG was performed using surface electrodes within 24 hours of the patient's admission to hospital. A senior neurologist analyzed the recordings.

Results

Imaging studies of four patients presenting with symptoms suggestive of hemispheric stroke were reviewed retrospectively to determine whether or not P-CT could prevent thrombolytic therapy being given to patients with stroke-mimicking conditions. All of the imaging studies were performed within 3 hours of symptom onset, and all patients were eligible to receive thrombolytic therapy. In these four cases, non-contrast CT performed within 3 hours of symptom onset revealed no major early signs of stroke (low signal density in more than 33% of the MCA territory), although perfusion anomalies were present in the same territory as the suspected stroke. CBF and CBV values were higher than in the contralateral hemisphere. The final diagnosis in all four patients was epileptic seizure of different causes.

Patient 1 was a 38-year-old woman with a known history of epilepsy who presented with sudden sensory and motor hemisyndrome (left-sided) and headache. A clinical diagnosis of stroke was made. CT imaging revealed no early signs of infarction, and P-CT showed hyperperfusion in the right temporal lobe, with increased values by 50% for CBF (64 mL/100 g/min) and 40% for CBV (3.7 mL/100 g/min), and a 30% decrease in MTT (3.4 sec) in the pathological hemisphere, matching the location of the pathological changes seen on EEG 2 hours later. CTA was normal.

Patient 2 was a 77-year-old woman with a history of chronic alcoholism who also presented with a left-sided sensory and motor hemisyndrome. Stroke was suspected, but there was no sign of an infarct on NECT. P-CT showed hyperperfusion of the right hemisphere, with increases in CBF of 50% (59 mL/100 g/min) and in CBV of 40% (5.5 mL/100 g/min) in the pathological hemisphere; the MTT was also 30% shorter (5.3 sec). Hypervascularization was seen on the CTA reconstructions (Fig. 1) of the right hemisphere. Follow-up MRI revealed right hippocampal sclerosis, and subacute encephalopathy with seizures in chronic alcoholism (SESA) syndrome was finally diagnosed. EEG waveform abnormalities were present in the right temporal area as revealed by the perfusion-imaging findings.