

Case 8

SOMATOM Definition AS+: Neuro Volume Perfusion CT of Intracerebral Metastatic Disease

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HISTORY

A 69-year-old female patient with a history of bronchial carcinoma presented to the Department of Neurology with a discrete left-sided, arm-accented, hemiparesis since the evening. She was fully orientated but very cachectic and in poor general condition.

DIAGNOSIS

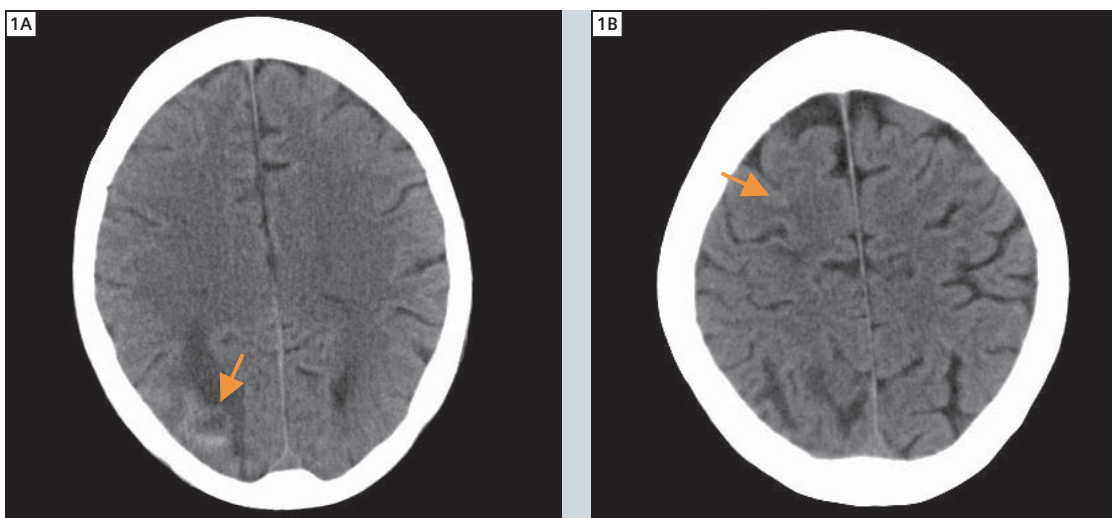
Neuroradiologic examination consisted of a cranial, non-enhanced CT (NECT) scan followed by Volume Perfusion CT (VPCT). NECT revealed a tumor in the subcortical white matter of the right parietal lobe (Fig. 1A). The tumor showed a rim-like hyperdensity with a central loss of density on NECT and was surrounded by an edema. A second small cortical lesion was visible in the right anterior lobe (Fig. 1B).

Assuming that the patient was suffering from multiple metastasis, we performed VPCT. The calculated permeability maps of VPCT showed multiple lesions with disrupted blood-brain-barrier throughout the whole brain (Figs. 2A–F), indicating the presence of numerous brain metastasis. The lesions showed an elevation of cerebral blood volume (CBV, Fig. 3) and contrast enhancement on the MIP images. In addition, we detected a severe prolongation of the mean transit time (MTT, Figs. 4A–C) and time to peak (TTP) in parts of the right MCA territory. The follow-up MRI examination on the same day visualized various metastasis supra- and infratentorial. In addition, we found subacute ischemic lesions on diffusion-weighted images in the area supplied by the right MCA which were al-

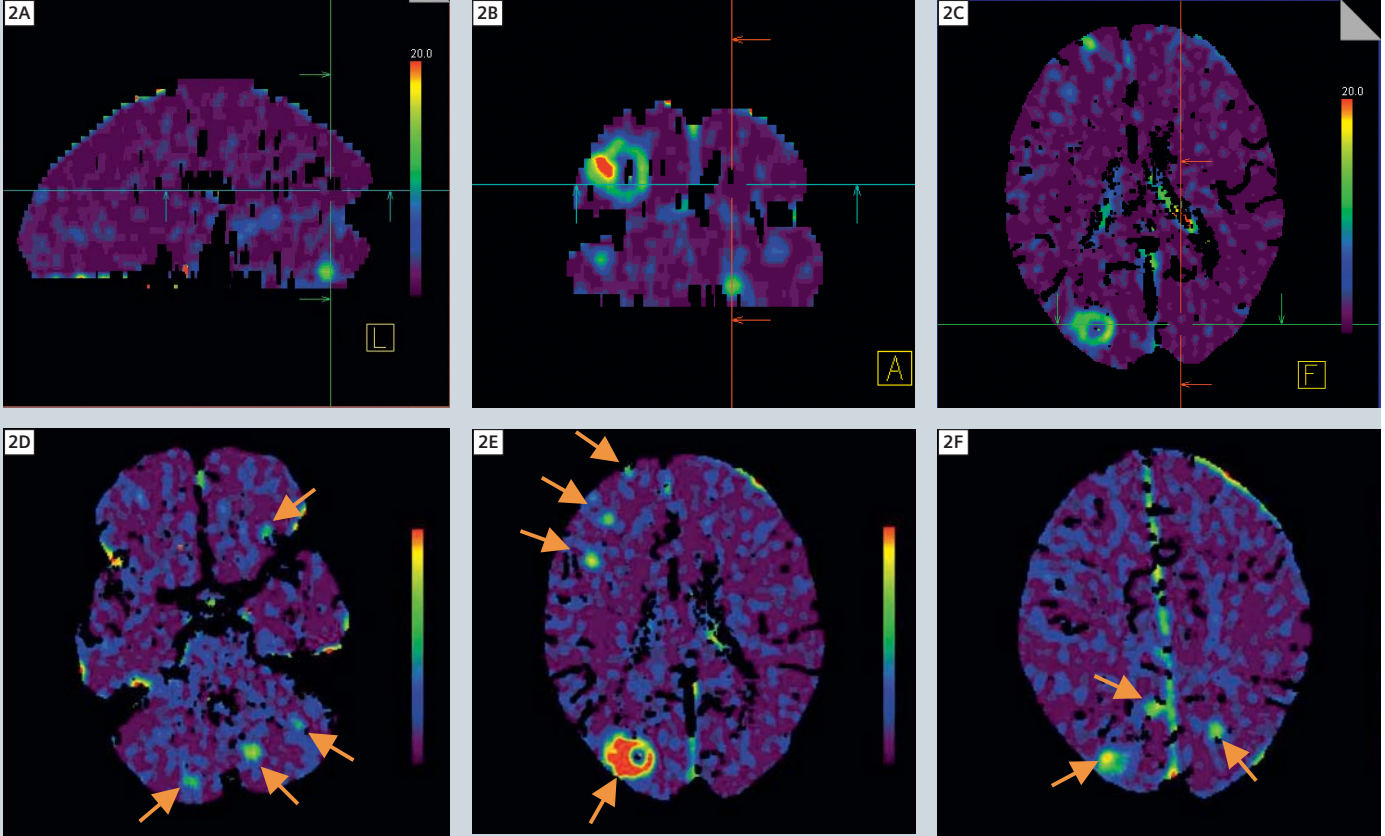
ready indicated by the prolonged MTT and TTP on VPCT.

COMMENTS

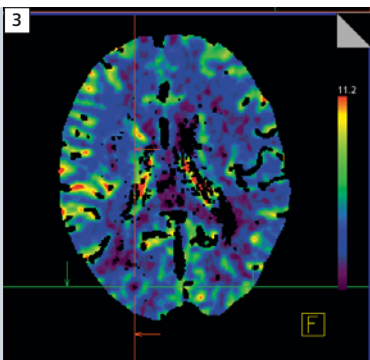
This case illustrates that VPCT can depict disturbances of the blood-brain-barrier even within smallest lesions that are not visible on NECT. Therefore VPCT is a meaningful method to reveal smallest metastasis within the scope of a CT examination. Further, this example demonstrates the multi-modality of VPCT. Although the examination and the postprocessing were focussed on the assumed diagnosis "tumor", we were able to uncover the supplemental ischemic lesion on the parameter maps.



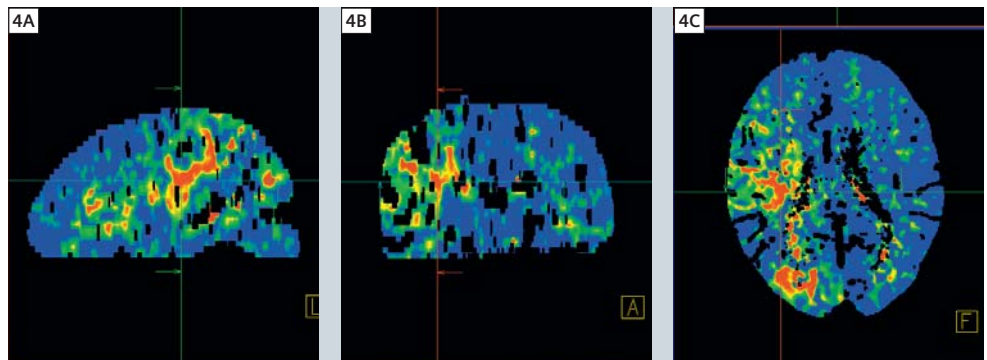
1 NECT revealed a tumor in the subcortical white matter of the right parietal lobe (Fig. 1A, arrow). The tumor showed a rim-like hyperdensity with a central loss of density surrounded by an edema. A second small cortical lesion was identified in the right anterior lobe (Fig. 1B, arrow).



2 VPCT showed multiple lesions with disrupted blood-brain-barrier throughout the whole brain (Figs. 2A–F, arrows), indicating the presence of numerous brain metastasis.



3 Additionally VPCT showed an elevation of cerebral blood volume (CBV) of the tumor.



4 3D evaluation of the brain detected an infarct seen as severe prolongation of the mean transit time (MTT) in parts of the right MCA territory.

EXAMINATION PROTOCOL

Scanner	<i>SOMATOM Definition AS+</i>		Spatial resolution	0.33 mm
Scan area	head		Slice width/Increment	5 mm & 3.0 mm increment
Scan length	96 mm (VPCT)		Reconstruction kernel	H20f
Scan time	40 s, one scan every 1.5 s (27 scans)		Contrast	
Scan direction	cranio-caudal		Volume/Flowrate	35 ml iomeprol 350 @ 5 ml/s 20 ml NaCl @ 5 ml/s
Tube voltage	80kV		Start delay	4 s
Tube current	Eff. 200 mAs		Postprocessing	syngo Volume Perfusion CT – Neuro (VPCT-Neuro)
Scan mode	Adaptive 4D Spiral			
eff. dose	5.2 mSv			
Rotation time	0.3 s			