

Brain Tumor: Pilocytic Astrocytoma



**Raphael Calmon, MD
and Nathalie Boddaert, MD PhD**
Pediatric Radiology Service
Necker Hospital - Paris - France

Introduction

This is an interesting example of how leakage correction works. The final diagnosis, pilocytic astrocytoma, is fairly straightforward. These tumors are usually described as having low cerebral blood volume, a misconception caused by the rupture of the blood brain barrier and the leakage of contrast in the interstitial medium. When corrected for agent contrast leakage the real CBV value is much higher than the uncorrected one.

Patient history

A 2 year-old girl presenting with left hemiparesia that occurred 7 days earlier is addressed for a cerebral CT scan followed by a multimodal MRI exam. The child underwent surgery and the tumor was completely resected, with good recovery of the motor deficit six months later.

Post treatment and analysis

PWI images such as rCBF (Cerebral Blood Flow), rCBV (Cerebral Blood Volume), K2 (Permeability map) were computed using the oSVD deconvolution method (Oscillation In-dex Singular Value Decomposition) available in the Automated Brain Tumor Olea Sphere® Application. (Olea Medical®, La Ciotat, France)
A multiparametric display (Perfusion maps, T1, T2, ADC) available in Olea Sphere® was used to segment volumes

of interest (VOI) and to provide quantitative values of the tumor metrics. A semi-automated tumor segmentation tool was used to create a VOI of the solid portion of the tumor (Figure 1) and the supratentorial white matter as a reference value (Figure 2).

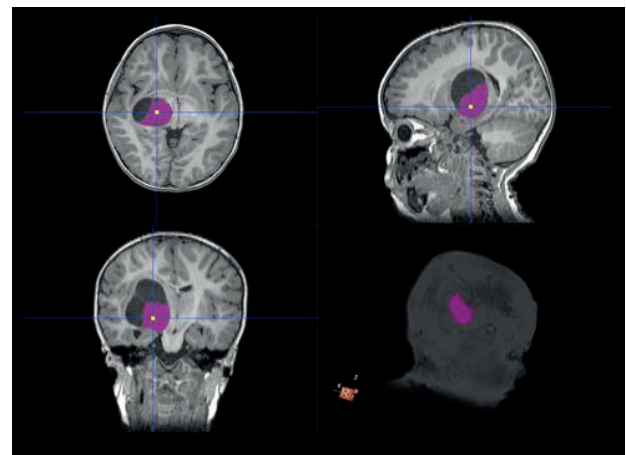


Figure 1 Enhancement of the solid portion of the tumor (11,27 cm³)

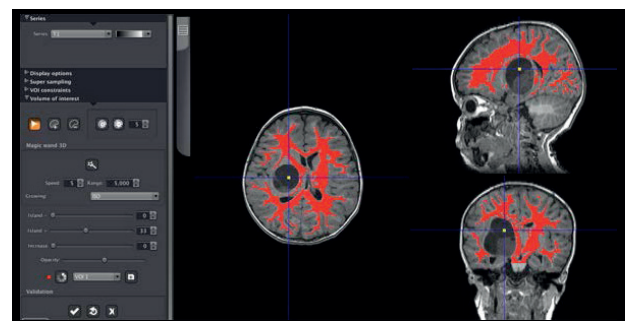


Figure 2 Segmentation of the supratentorial white matter (volume of reference)

The volume of interests were applied to the different perfusion maps. The relative rCBV value with leakage correction (obtained by dividing the average tumor VOI value by the average reference VOI value) was 1.58. The relative rCBF with leakage correction was 1.12 and the relative rCBV without leakage correction was 0.45.

Diagnosis

Thalamo-peduncular pilocytic astrocytoma.

Treatment

Surgical excision of the tumor.

Discussion

The low blood volume attributed to pilocytic astrocytoma is caused by the disruption of the blood brain barrier and the leakage of contrast in the extravascular extracellular space. Therefore, in regions of contrast agent leakage the concentration time curve is likely to decrease below the baseline value due to T1-shortening effects causing a potential underestimation of relative blood volume rBV. When corrected for contrast leakage, the relative cerebral blood volume of the solid lesion component increased from 0.45 (uncorrected rCBV) to 1.58 (corrected rCBV).

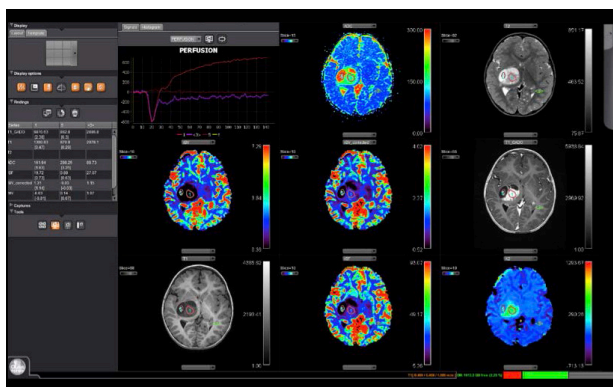


Figure 3 Multiparametric display : ADC, T2, rCBV, rCBV corrected, T1 gadolinium, T1, rCBF, K2

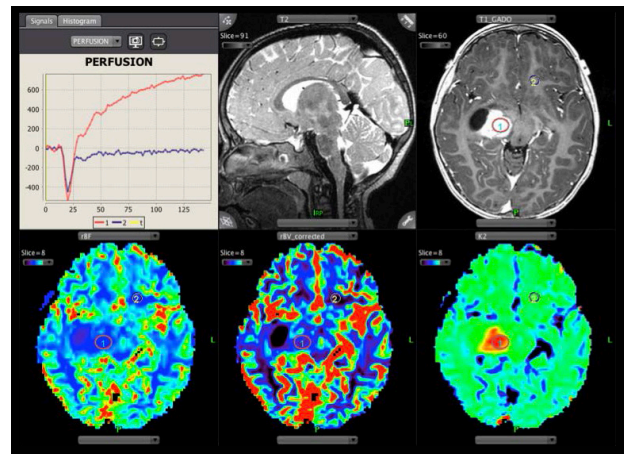


Figure 4 Multiparametric display: Perfusion curve, T2, T1 gadolinium, rCBF, rCBV corrected, K2

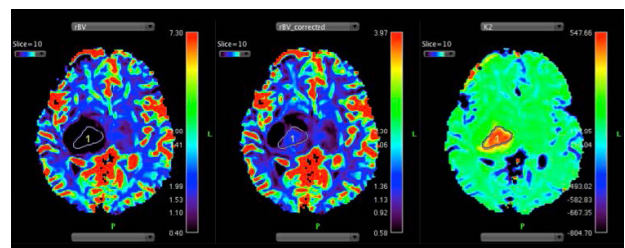


Figure 5 rBV, rBV corrected, K2 ; rBV without leakage correction is underestimated on the solid portion

OLEA MEDICAL®

www.olea-medical.com

Olea Sphere® v3.0, medical imaging post-processing software, is a medical device manufactured and marketed by Olea Medical®. This medical device is reserved for health professionals. The software has been designed and manufactured according to the EN ISO 13485 quality management system. Read the instructions in the notice carefully before any use.

Instructions for Use are available on <http://www.olea-medical.com/en/> Manufacturer: Olea Medical® S.A.S. (France). Medical devices Class IIa / Notified body: CE 0459 GMED.

**IMPROVED
DIAGNOSIS
FOR LIFE**