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Case Report

Cerebral Dural Arterio-Venous Fistula – Part I: Virtual Anatomy and Pathoanatomy in Ct and Mr Imaging

Michael Hofko[1*], Michael Sonnberger[2], Franz A. Fellner[1,3]

[1]Central Radiology Institute, Kepler University Hospital, Medical Faculty of the Johannes Kepler University, Linz, Austria.

[2]Institute of Neuroradiology, Kepler University Hospital, Medical Faculty of the Johannes Kepler University, Linz, Austria.

[3]Medical Faculty of the Friedrich-Alexander-University of Erlangen-Nürnberg, Erlangen, Germany

***Corresponding Author:** Michael Hofko, Central Radiology Institute, Kepler University Hospital, Medical Faculty of the Johannes Kepler University, Linz, Austria.

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Abstract

Case report of a 60 years old male patient, at first his clinical symptoms were interpreted as a cerebrovascular stroke. Imaging work up with CT, MRI and DSA of the cerebral arteries and veins was performed. Final diagnosis revealed an occipital dural arteriovenous fistula classified Cognard Typ IV.

Key Words: virtual anatomy; virtual pathoanatomy; cerebral dural arterio-venous fistula; computed tomography (ct); magnetic resonance (mr) imaging; cinematic rendering (cr)

Introduction

Dural arteriovenous fistula (DAVF) is a type of AVM in which there is a communication between dural arteries and cerebral venous sinuses. These lesions constitute 10–15% of all cerebral AVMs and most of them seemed to be acquired, only some are congenital. There is a female to male ratio of 2:1 and most of them are diagnosed in the fifth and sixth decade. The distinguishing feature between DAVF and cerebral AVM is the fact that there is no parenchymal nidus and there is a dural arterial supply [1].

We demonstrate a case of a 60-years old man, who came to our hospital with a clinical suspected diagnosis of a cerebrovascular stroke. Imaging work up consisted of CT and MRI scan, furthermore a DSA of the cerebrovascular arteries/veins was carried out.

Case Report

We present a case of a 60-years old male patient, who was transferred to the neurology department with violent headache, dysesthesia of the right upper and lower limb and unconsciousness for an hour one day before with retrograde amnesia now. The neurologists suspected an ischemic stroke.

The patient´s history was largely unremarkable, mild arterial hypertonus was well treated with an ACE-Inhibitor. The patient denied any previous neurological diseases.

At first, a CT scan of the brain was performed to exclude intracerebral hemorrhage. This showed pronounced, slightly hyperdense tubular structures (Figure 1a) in the left temporal lobe and a hypodense area located in the left parietal and frontal lobe (Figure 1b).

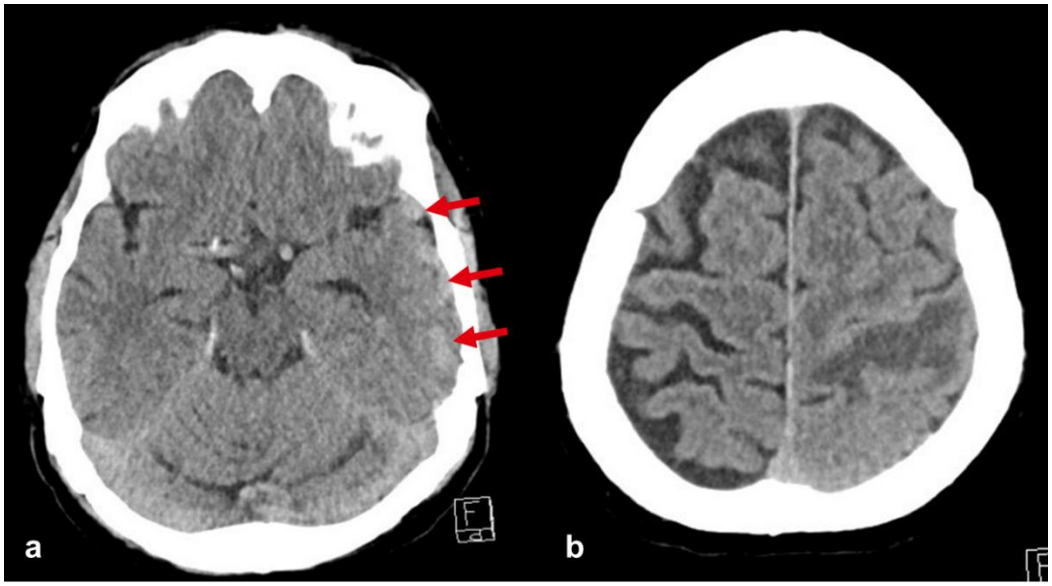

Figure 1: *a) Slightly hyperdense tubular structures in the left temporal lobe (arrows). b) Hypodense area in the left central area.*

We then immediately started a contrasted enhanced MR examination including standard imaging sequences, arterial and venous 3 D time-of-flight (TOF) MRA, susceptibility-weighted imaging (SWI), and contrast-enhanced T1-weighted 3D gradient-echo.

Standard MR imaging sequences before i.v. administration of contrast agent (FLAIR, T2-weighted spin-echo, T1-weighted spin-echo) revealed areas with late subacute brain hemorrhage in the left central region and the left frontal lobe (Figure 2).

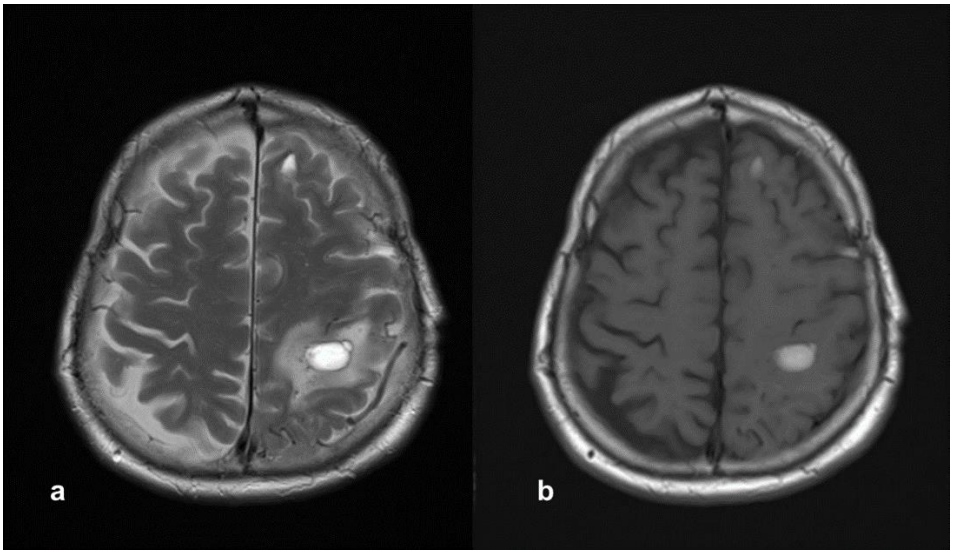

Figure 2: *Late subacute hemorrhage in the left central area and the left frontal lobe (arrows). a) T2-weighted turbo spin-echo, b) T1-weighted spin-echo before i.v. contrast agent administration.*

Susceptibility weighted imaging showed multiple suspect vessels in the vicinity of the central hemorrhage (Figure 3) in the left hemisphere.

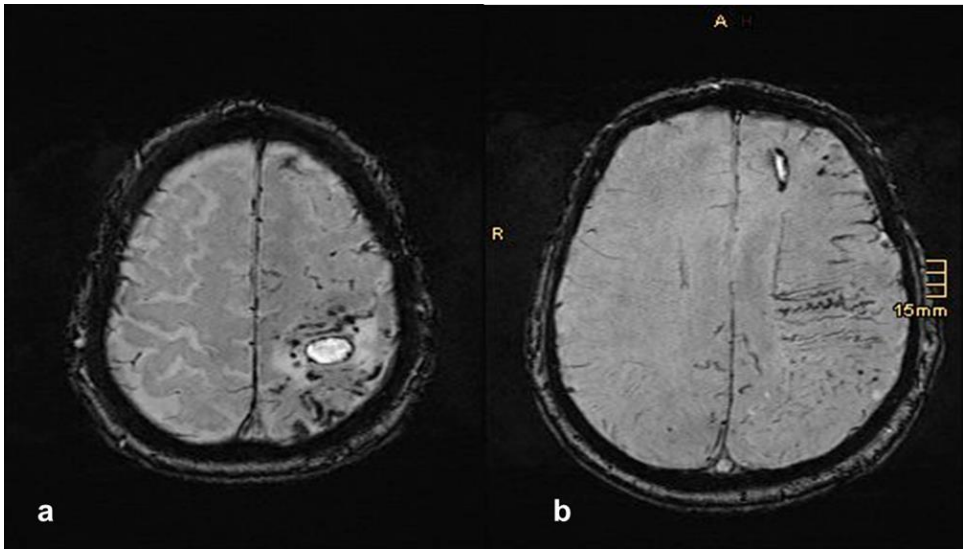

Figure 3: *Susceptibility weighted imaging. Multiple suspect vessels are found in the area surrounding the central hemorrhage.*

The arterial and the venous TOF-MRA, reconstructed with maximum-intensity projections and Cinematic Rendering [3,4] showed a suspicious vascular formation, probably of arterial origin, in the left occipital region and then strongly dilated veins (Figure 4).

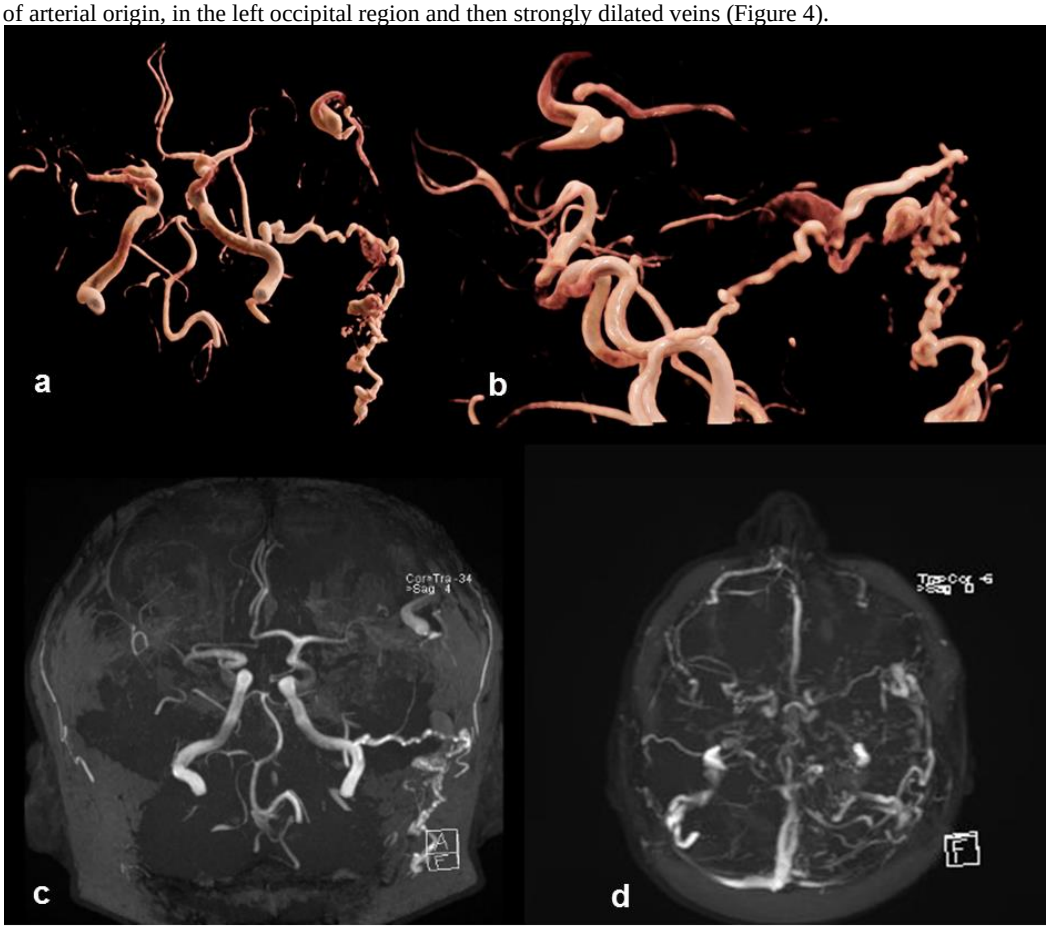

Figure 4: *Suspicious arterial formation on the left occipital with subsequent dilated veins. a), b) arterial TOF-MRA reconstructed with Cinematic Rendering, b) arterial TOF-MRA reconstructed with maximum-intensity-projection, d) venous TOF-MRA reconstructed with maximum-intensity-projection*

The dilated veins in the left hemisphere were best seen in the contrast-enhanced T1-weighted 3D gradient-echo sequence (Figure 5).

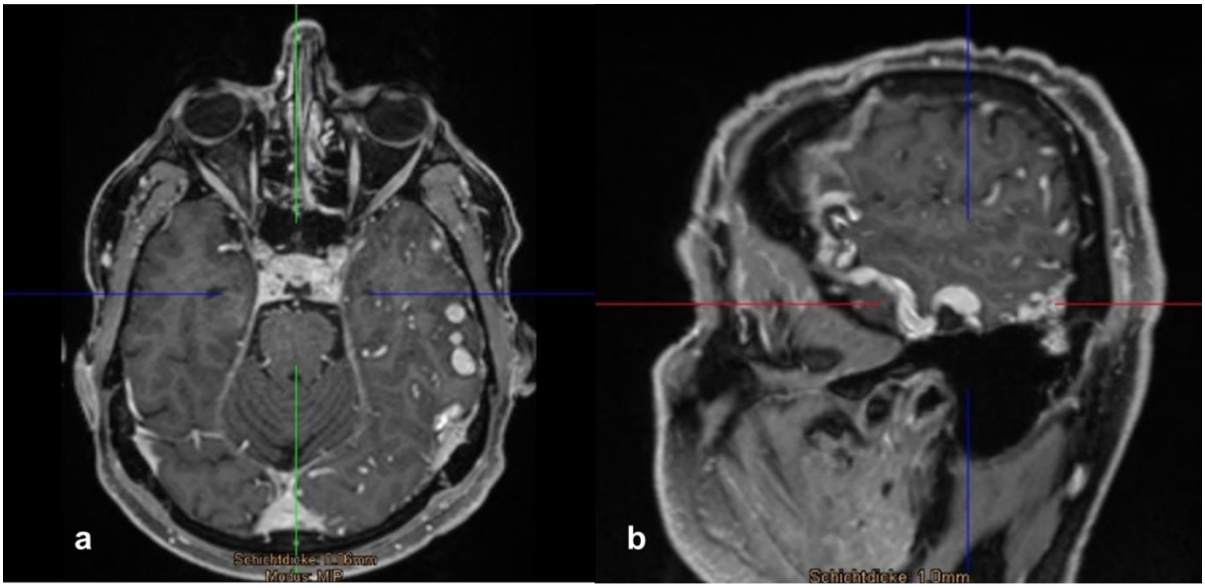

Figure 5: *The contrast-enhanced T1-weighted 3D gradient-echo sequence best shows the multiple congested and tortuous veins in the left hemisphere.*

Based on these MR findings, we suspected a vascular malformation, most likely in the sense of a dural arterio-venous fistula. Therefore, the next step was to perform an intra-arterial digital subtraction angiography to confirm this suspicion.

The intra-arterial digital subtraction angiography then verified a strong arterio-venous fistula with feeders from the occipital artery and a petrous branch of the middle meningeal artery. There was a fistula at the inflow into the superficial temporal vein with retrograde filling in cortical veins and as well as a clearly dilated draining vein (Figure 6). Therefore, final diagnosis was occipital dural arterio-venous fistula on the left side, Cognard grade IV.

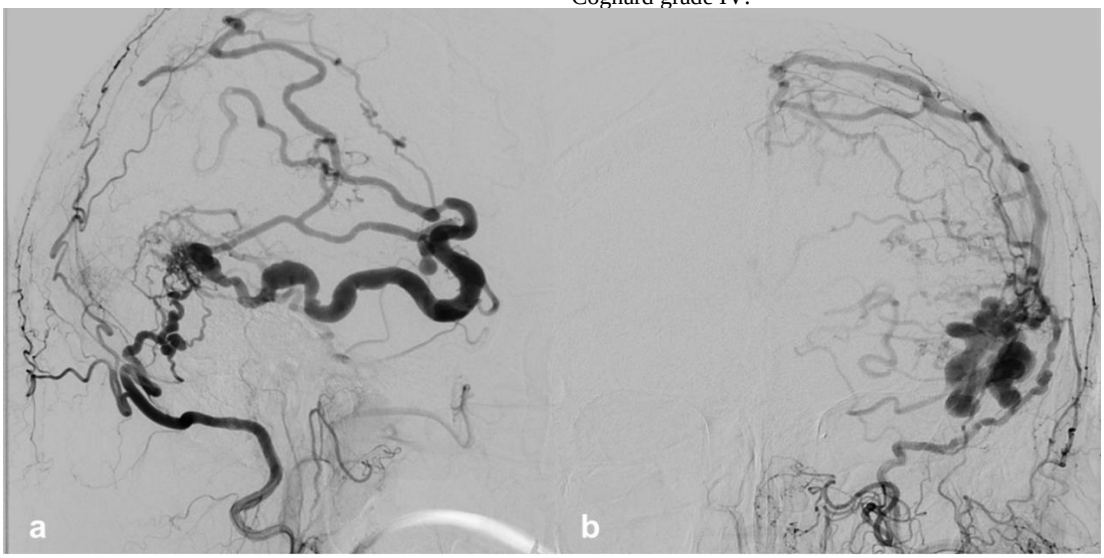

Figure 6: *Intra-arterial digital subtraction angiography of the dural arterio-venous fistula Cognard grad IV. a) lateral view, b) ap view*

Discussion

Dural arterio-venous fistulas are arteriovenous shunts, supplied by a dural artery to a dural venous channel, mostly located near a major venous sinus. These fistulas are divided into 5 grades:

I	Normal antegrade flow into dural sinus
II	a. Retrograde flow into sinus(es) b. Retrograde filling of cortical vein(s) c. Retrograde drainage into sinus(es) and cortical veins
III	Direct drainage into cortical veins without venous ectasia

IV	Direct drainage into cortical veins with venous ectasia >5 mm and 3x larger than diameter of draining vein
V	Drainage to spinal perimedullary veins

Most of them seem to be acquired (i.e. trauma, surgical, chronic infection or sinus thrombosis), some of them are congenital. In the pediatric population, most of them are associated with venous anomalies.

Dural arterio-venous fistulas are diagnosed in all age groups, mainly in the fifth and sixth decades of life. There is a higher incidence in female patients (female to male ratio 2:1), estimated incidence is 0,17 case in 100000 population and they represent 10 – 15 % of cerebral vascular malformations [2].

Disclosure

All co-authors do not report conflicts of interest.

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