

Moyamoya by magnetic resonance imaging scan

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ABSTRACT

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CASE REPORT

A 15-year-old Sudanese male was referred to the Magnetic Resonance Imaging (MRI) department with severe headache. Brain MRI axial T₁, T₂, diffusion, post contrast series, fluid attenuation inversion recovery (FLAIR) and time-of-flight magnetic resonance angiography (TOF-MRA) techniques were obtained. Images showed tiny punctuate signal void in all pulse sequence in both basal ganglia. Also there are a number of collaterals seen surrounding the mid brain and within the supra sellar cistern.

In postcontrast enhancement images there are obvious enhanced collaterals within the sulci of both cerebral hemispheres, the posterior fossa structures including the brain stem appeared intact. The obtained diffusion weighted images showed no evidence of recent ischemic insult. There was no obvious intra axial mass lesion, signal of blood degradation or extra axial fluid collection.

Magnetic Resonance Angiography (MRA) describes described both internal carotid arteries; they showed obvious occlusion of their supraclinoid portions without

well formed circle of Willis, besides tortuous collaterals seen surrounding cistern forming A net-like appearance, the vertebral arteries as well as the basilar artery were intact.

An MRA revealed bilateral supraclinoid internal carotid arteries occlusion without well formed circle of Willis and collateralization as Moyamoya disease (Figure 1).

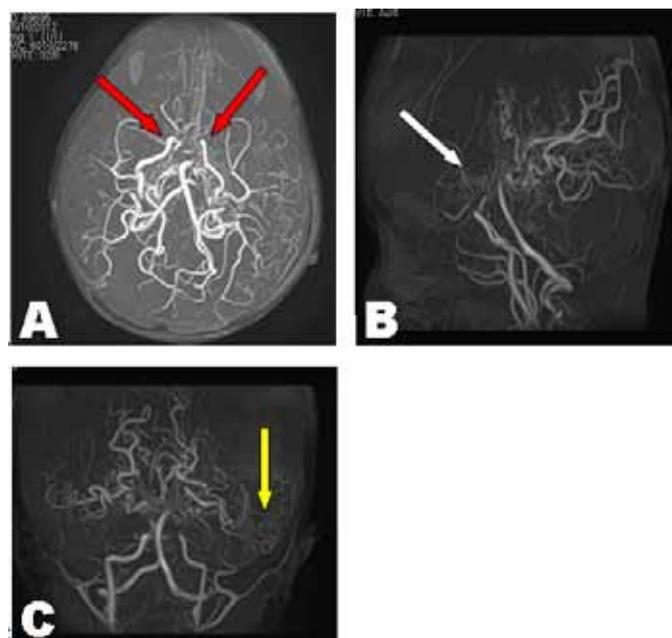


Figure 1: Magnetic Resonance Angiography axial, sagittal, coronal brain images of 15-year-old Sudanese boy showing Moyamoya Disease (A) Both internal carotid arteries explain obvious occlusion (red arrows) of their supra clinoid portion, (B) Circle of Willis (white arrow) is not well formed, (C) Tortuous collaterals are seen surrounding cistern forming net like appearance (yellow arrow).

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DISCUSSION

Moyamoya is a rare cerebrovascular disease among Japanese [1]. Ethnicity-incidence ratios for Whites as compared to Asian-Americans were 1:4.6, and as compared to African-Americans was 1:2.2. To the best

of our knowledge, no similar cases have been reported in Sudanese population in existing literature [2]. The pathogenesis of Moyamoya is idiopathic progressive arteriopathy of childhood; where occlusion of the circle of Willis, narrowing of distal internal carotid artery (ICA) and proximal circle of Willis vessels with secondary collateralization are detected the disease is poorly understood and may be due to genetic and environmental factors [3, 4]. The diagnosis of Moyamoya disease can be diagnosed by different imaging modalities and radiographic evaluation and it primarily depends on angiographic results, including occlusion of the supraclinoid ICA and formation of extensive collateral vessels [1, 3]. Several previous studies have revealed that Moyamoya disease can be identified on contrast-enhanced computed tomography (CT) or MRI, owing to their sensitivity to ischemic changes [5–7].

Three-dimensional CT angiography have limitations in diagnosis of Moyamoya disease because of the limited spatial resolution, difficulty in covering the whole intracranial vasculature network of leptomeningeal anastomotic channels [1]. The assessment of cerebral ischemia associated with Moyamoya by diffusion-weighted MRI has value in disease evolution [8]. Infarctions are better delineated with T_1 - and T_2 - imaging [9, 10]. The MRI findings in T_1 are multiple dot-like flow voids in basal ganglia, T_2 -weighted images are of high signal small vessel cortical and white matter infarcts, collateral vessels appear as “net-like” cisternal filling defects, FLAIR shows Bright sulci at leptomeningeal “ivy sign”[3]. Another MR protocols are useful in Moyamoya; T_2 star gradient recall echo is useful prior hemorrhage, T_1 with contrast shows Lenticulostriate collaterals with enhancing “dots” in basal ganglia and “net-like” thin vessels in cisterns, Leptomeningeal enhancement gives “ivy sign”, MR spectroscopy show Lactate in acutely infarcted tissues and NAA/Cr and Cho/Cr ratios frontal white matter increase after revascularization, Perfusion-weighted imaging (PWI) shows low perfusion deep hemispheric white matter, is relatively high perfusion posterior circulation, PWI may be abnormal when MRI still normal [3].

Moyamoya on MRI is characterized by diminishing of flow voids in the internal carotid and middle and anterior cerebral arteries together with collateral flow voids in the basal ganglia and thalamus [11–13].

Magnetic Resonance Angiography (MRA) has been used to demonstrate the intracranial vessels, where it is non invasive, no contrast media, and ionizing radiation is used. MRA is useful in the diagnosis of Moyamoya disease as mentioned by Yamada et al. [14]. MRI has been proposed to be used instead of conventional cerebral angiography [12].

CONCLUSION

Regardless of the excellent diagnostic value, broad imaging protocols and noninvasive nature, it has been

proposed that magnetic resonance angiography should be used as a diagnostic imaging modality for Moyamoya disease.

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Author Contributions

Caroline Edward Ayad – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Ahmed Alamin Alnoor – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Aymen El-Mesallamy – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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