A CASE REPORT: EARLY FINDINGS OF DISTAL VESSEL OCCLUSION PRE AND POST-THROMBOLYSIS USING THREE-DIMENSIONAL BLACK BLOOD VESSEL WALL IMAGING IN ACUTE STROKE.

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1. INTRODUCTION

Direct visualization of intra-arterial thrombus in acute ischemic stroke is widely described in large vessel occlusion in the form of a hyperdense middle cerebral artery (MCA) sign on Computed Tomography (CT) or blooming artifact on gradient echo Magnetic Resonant Imaging (MRI) sequence [1]. However, in a smaller distal vessel occlusion (DVO), the sensitivity of these signs is not reliable (2). The emergence of three-dimensional (3D) black blood (BB) contrast-enhanced MRI enables us to visualize the distal vessel wall and intraluminal features to narrow down the differential cause of ischemia and possible biomarker to monitor response towards reperfusion therapy. In this report, we demonstrate features of distal vessel occlusion in the cortical branch of M4 in acute ischemic stroke less than 2 hours from onset. The 3D-BB MRI changes supported by clinical improvement in post-reperfusion therapy is also described.

2. CASE REPORT

A 37 years old Malay male with a risk factor of chronic smoker falls in the bathroom and subsequently developed dysarthria and receptive aphasia. The premorbid Modified Rankin Score (MRS) was 0 with no known underlying disease. The National Institute Health Stroke Scale (NIHSS) is 6 with language and speech as the main component affected. There is no limb weakness or other neurological deficits. Electrocardiogram revealed arterial fibrillation.

MRI was done within 2 hours from symptom shows the area of restricted diffusion with Fluid Attenuation Inversion Recovery (FLAIR)- Diffusion-weighted imaging (DWI) mismatch at left parietal lobe (Figure 1A-B). There is also cortical enhancement noted at the MCA-PCA (posterior cerebral artery) watershed region suggestive of subacute infarct (Figure 1D) which explained the cardioembolic origin of stroke secondary to undiagnosed arterial fibrillation. The time of flight MRA revealed an absent flow signal of the affected cortical artery (Figure 2). The sequences protocol for 3D-BB post contrast in our institution were set with the following parameters: TR/TE=700/35, FOV=200 x 251, matrix size=252 x 314. The 3D-BB MRI post-contrast shows an interface between peri-thrombus vascular hyperintensity sign (PVHS) and intraluminal enhancement of the affected segmental M4 cortical branch of the left MCA artery (Figure 3A-B).

Thrombolysis commenced with Alteplase 0.9 milligram per kilogram total of bolus and one-hour infusion. Immediate NIHSS score post thrombolysis was static. Improvement of NIHSS to 2 noted after 8 hours post thrombolysis. Dual antiplatelet was started on day 5 from the onset and before discharge, the NIHSS score improves to 1 leaving only mild sensory component affected. Repeated 3D-BB MRI five days after the acute event shows luminal patency of the affected cortical vessel indicative of a good response towards reperfusion therapy (Figure 3C).

3. DISCUSSION

Detection of intraarterial thrombus in distal vessel occlusion (DVO) is becoming increasingly important in acute stroke imaging. The evolution of medical devices for mechanical thrombectomy has allowed the smaller distal vessels to be treated via an endovascular approach[3]. Besides, it is also useful to reassess vascular patency after the administration of thrombolysis agents. Large vessel occlusion (LVO) is undisputedly a known cause for disability in acute stroke but DVO in an eloquent area of a specific branch may potentially lead to a significant neurological deficit [3].

Advances in MRI allow detection of intraarterial thrombus via 3D-BB vessel wall imaging. The high signal

intensity of the vessel wall around the thrombus is described as PVHS in the previous study [4]. The exact pathophysiology of PVHS remains unclear. The presence of PVHS together with a long segment of intraluminal enhancement along the vessel course adjacent to the thrombus may be explained by stasis or retrograde blood flow. In some cases, PVHS could also disappear as soon as 24 hours post-reperfusion therapy [4]. Our case demonstrates reperfusion of the affected vessel after day 5 post thrombolysis evidence by resolution of the previously noted PVHS and intraluminal enhancement (Figure 3B). Restoration of arterial flow suppression on 3D-BB supports these findings. The presence of vessel wall and adjacent brain parenchymal enhancement are attributed to the disruption of the blood-brain barrier as sequelae of acute ischemic stroke [5].

4. CONCLUSION

Vessel wall imaging features in this case followed by vast clinical improvement after thrombolysis highlight the potential of 3D-BB post-contrast imaging to predict the outcome of reperfusion therapy for DVO. A larger study is needed to verify these early findings.

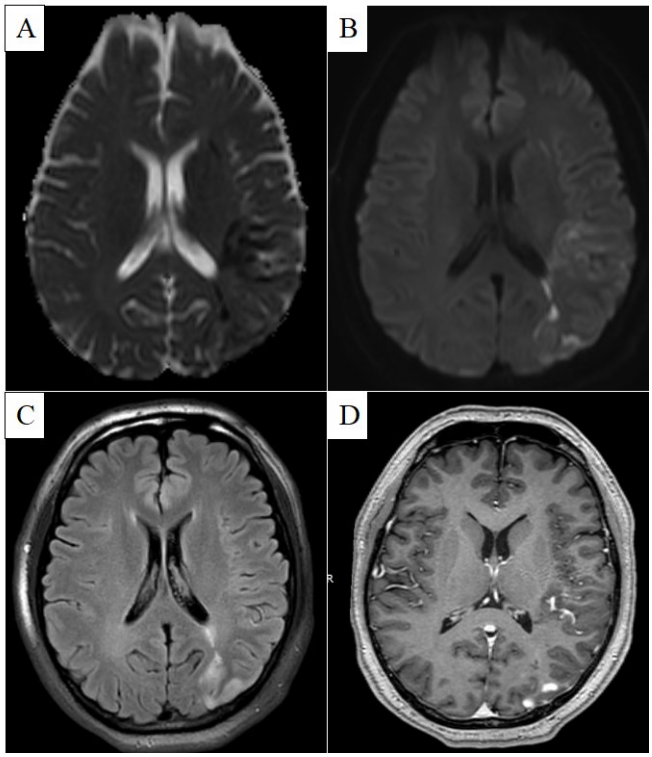

Figure 1: Axial projection of MRI shows restricted diffusion at the left parietal lobe on Apparent diffusion coefficient and Diffusion-weighted imaging (A-B) with mismatch on FLAIR (C). Hyperintensity on FLAIR with cortical enhancement indicating subacute infarct at MCA-PCA watershed region (D).

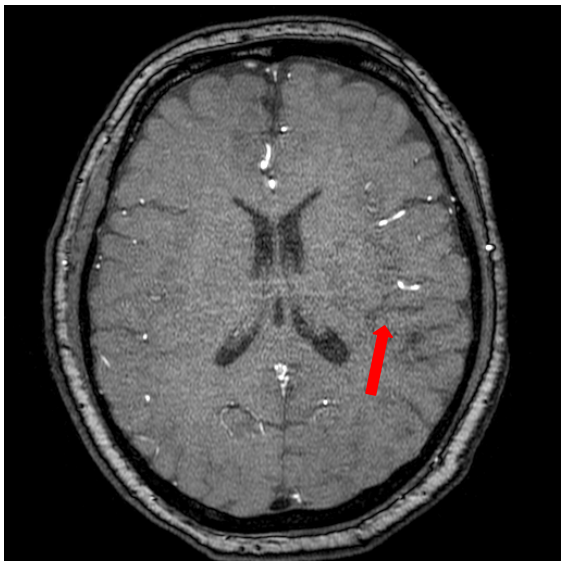

Figure 2: Axial projection Time of Flight MRA shows absent flow signal at left M4 cortical branch (Arrow).

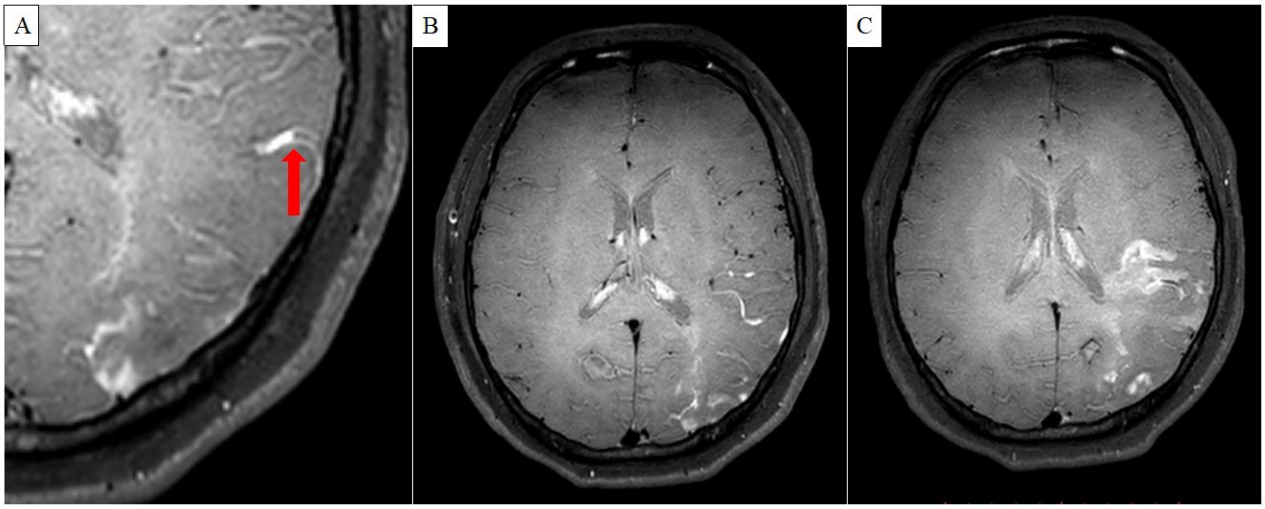

Figure 3: Axial projection three dimensional black blood (3D BB) sequence shows interface (arrow A) between peri-thrombus vascular hyperintensity sign (PVHS) and intraluminal enhancement of the affected segmental M4 cortical branch of the left MCA (B). Post thrombolysis shows resolution of intraluminal enhancement with marked surrounding vessel wall and adjacent parenchyma enhancement (C).

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