



## HYPERDYNAMIC FLOW AFTER RECANALIZATION OF MCA STROKE, DETECTED BY TRANSCRANIAL DOPPLER

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**KEYWORDS :** Transcranial Doppler, MCA stroke, Hyperdynamic flow, Hyperperfusion.

**Abbreviations:** TCD – Transcranial Doppler, MCA – Middle Cerebral Artery, PCA – Posterior Cerebral Artery, PSV – Peak Systolic Velocity, MFV – Mean Flow Velocity, EDV – End diastolic Velocity, PI – Pulsatility Index

### Introduction:

Transcranial doppler is a non invasive modality to examine the cerebral vasculature and provides reliable information regarding cerebral blood flow. Transcranial doppler can be used to document recanalization after thrombolysis in stroke, and can be useful in prognosticating patients with acute stroke. We report two cases of middle cerebral artery stroke with evidence of hyperdynamic flow following spontaneous and pharmacological reperfusion respectively.

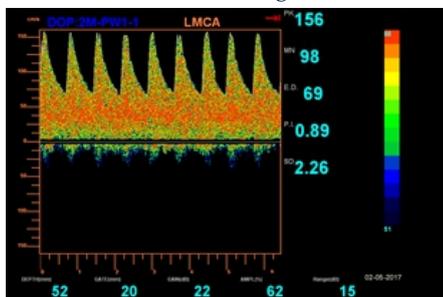
### Case 1:

Our first patient was a 60 years old diabetic male who developed sudden onset right hemiplegia and global aphasia. On the second day, he had spontaneous improvement in right sided weakness, and was able to walk. His language fluency also improved, but he remained unable to comprehend other's speech. On examination he was found to have a Wernicke type aphasia and motor power was normal. CT brain showed hypodensity in the left MCA and MCA-PCA watershed territories. Transcranial doppler examination was done and it showed high velocity flow in the right MCA, with low pulsatility index, indicating a low resistance flow.

**Table 1: Comparison of right and left MCA velocities**

Artery	PSV	EDV	MFV	PI
Right MCA	106	40	62	1.06
Left MCA	156	69	98	0.89

**Figure 1: TCD waveform obtained in right MCA**



The velocities were found to be increased along the entire length of the right MCA and ACA, along with the terminal internal carotid artery (ICA), suggestive of a hyperdynamic flow state.

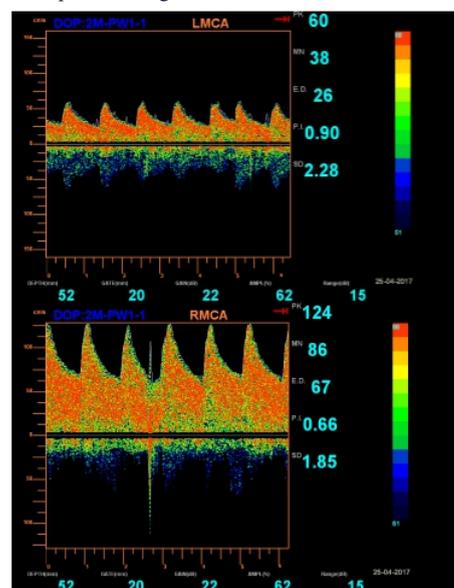
He was further evaluated with MRI brain, which showed haemorrhagic transformation of the infarct, probably secondary to spontaneous reperfusion. MR angiography was normal. Thus the improvement in neurological deficit can be explained by spontaneous recanalization and TCD showed evidence of hyperdynamic flow in the recanalized MCA.

### Case 2:

Our second patient was a 55 year old gentleman, known diabetic, who presented with acute left hemiparesis of 3 hours duration. NIH score at admission was 14. CT brain ruled out bleed and transcranial doppler done at the time of admission showed no flow in the right MCA. He

was thrombolysed with Injection Alteplase 50mg. The left sided weakness improved within 1 hour and the NIH score improved to 6. Transcranial doppler was repeated after thrombolysis. It showed evidence of high velocity flow in the right MCA, with low pulsatility index, indicating a hyperdynamic flow.

**Figure 3: Comparison of right and left TCD waveforms.**



### Discussion:

Hyperdynamic flow results in elevated peak systolic velocities and low pulsatility index as a result of low resistance. At the same time, arterial stenosis also causes elevation in flow velocity with variable pulsatility index. However, in arterial stenosis the elevation in velocity is restricted to the stenotic segment, and more distal parts of the artery show blunted flow. In case of hyperdynamic flow, the velocity is elevated throughout the artery. Hence it is essential to examine the entire length of the artery to differentiate between arterial stenosis and hyperdynamic flow(2). Presence of bruit or turbulence is another factor which would point to the diagnosis of arterial stenosis.

Hyperperfusion following pharmacological thrombolysis has been reported previously(3), using CT perfusion studies. Our cases illustrate that hyperdynamic flow can occur following both spontaneous and pharmacological recanalization of MCA stroke. Hyperperfusion can sometimes result in worsening neurological deficit or unexpected clinical features like psychiatric manifestations(4). In such cases the patient would potentially benefit from blood pressure reduction. Thus in any patient with acute stroke and worsening deficit, it is essential to determine whether the patient has a persisting arterial occlusion or not. Transcranial doppler is a non invasive bedside investigation that supplies real time information regarding cerebral blood flow. Thus it can be useful in guiding the management of hemodynamic status in acute stroke.

It should be noted that the transcranial doppler findings are also dependent on a number of systemic factors including the heart rate and

stroke volume. In patients with severe left ventricular dysfunction for example, the flow velocities can be falsely low.

**Conclusion:**

Hyperdynamic flow occurs after both spontaneous and pharmacological reperfusion of MCA stroke. Transcranial doppler is useful in monitoring and managing these patients.

**References:**

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