Neuroradiology Nuggets - 03

Visualizing the hidden steal: Multimodal imaging in subclavian steal syndrome

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Abstract

Background: Subclavian steal syndrome is a rare vascular phenomenon caused by proximal subclavian artery stenosis or occlusion, leading to retrograde blood flow in the ipsilateral vertebral artery to supply the arm. Patients are often asymptomatic, but the condition can manifest with varied and severe symptoms of vertebrobasilar insufficiency (e.g: vertigo, syncope, ataxia) or upper limb ischemia, particularly when collateral circulation is insufficient or during increased demand. The use of multimodal imaging is crucial for accurate diagnosis and treatment planning.

Key words: Diffusion weighted imaging (DWI); Fluid attenuated inversion recovery(FLAIR); Susceptibility weighted imaging (SWI); Time of Flight MR angiogram (TOF-MRA)

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1. Introduction

A 72-year-old male presented to the ER with symptoms of right sided weakness. MRI brain stroke protocol, including sequences- Diffusion weighted imaging (DWI), Fluid attenuated inversion recovery(FLAIR), Susceptibility weighted imaging (SWI) and Time of Flight MR angiogram (TOF-MRA) of brain and neck- was performed.

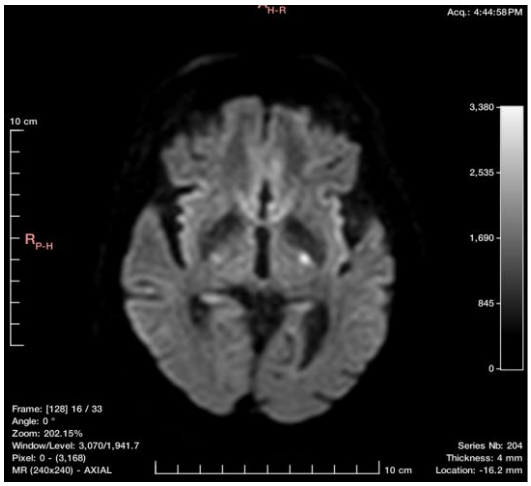

Fig (1)

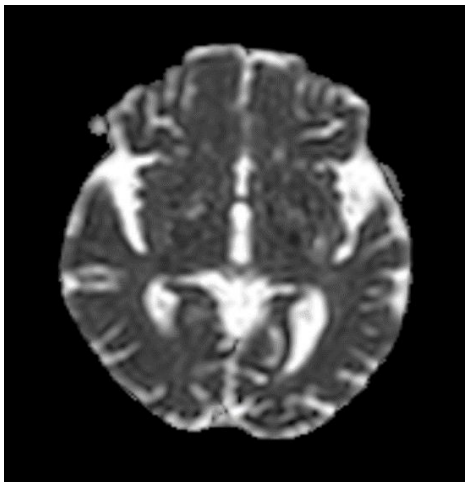

Fig (2)

Fig (1) & (2): DWI images showed focal asymmetrical restricted diffusivity in the posterior limb of left internal capsule, suggestive of acute infarct

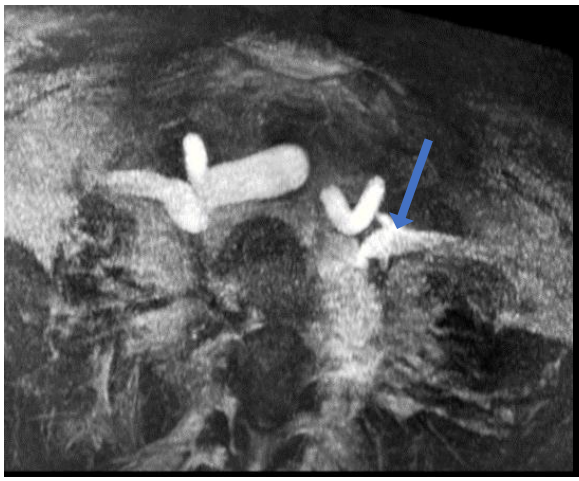

Fig (3)

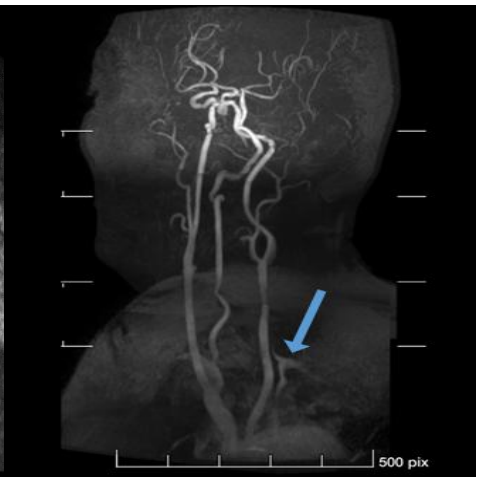

Fig (4)

Fig (3) & (4): Time of flight MRA MIP images showed incidental suspicious narrowing along the proximal left subclavian artery

Fig (5) **Fig (6)**

Fig (5) & (6): MRA showing non visualization of left VA along its entire course

3. Discussion

Non visualization of flow signals in the left vertebral artery on MRA could be secondary to the following causes;

- Chronic steno-occlusion and slow/absent flow leading to absent TOF MRA signals
- Underlying subclavian steal due to proximal steno-occlusion of the left SCA with reversal of flow along the VA.

USG-Doppler can help differentiate by the direction and flow evaluation of VA.

CTA can help further for treatment including angioplasty/stenting of the left SCA.

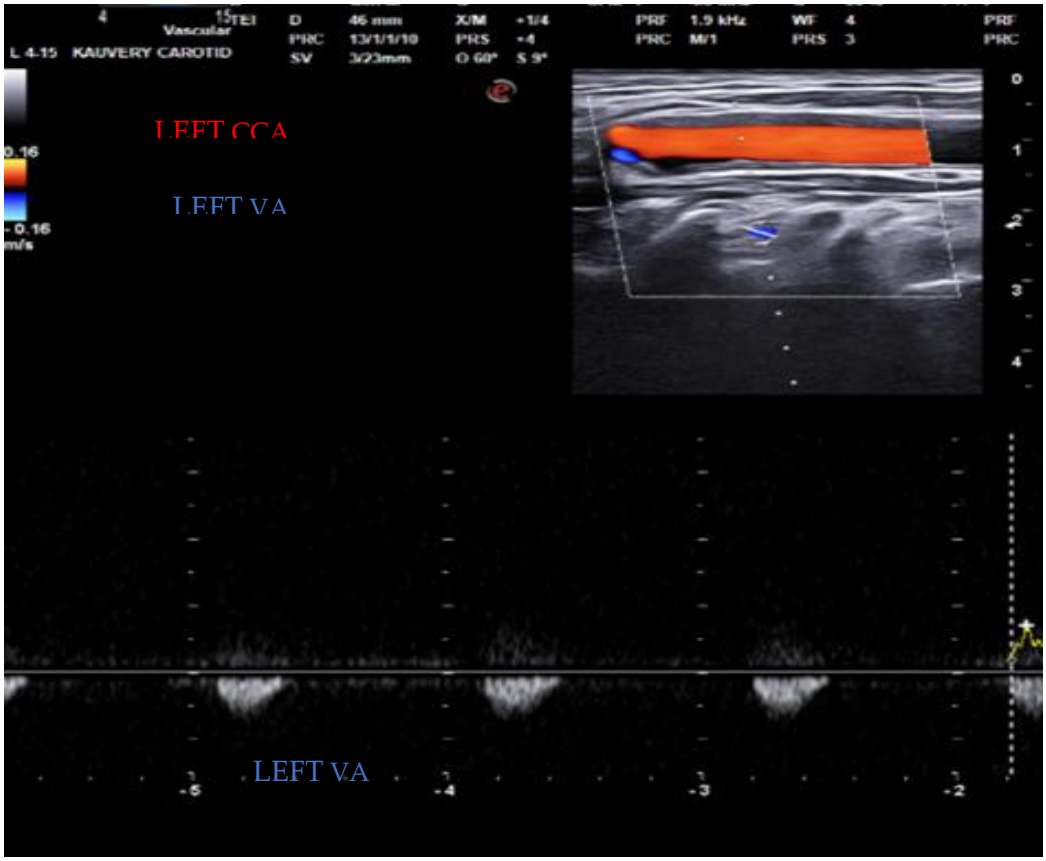

Fig (7): Duplex colour doppler ultrasound showing flow reversal in the left vertebral artery

3.2 Vertebral steal on Doppler is indicated by

- Opposite colour on colour Doppler as compared to ipsilateral carotid
- Reversal of spectral flow below the baseline

3.3 Literature review and Summary

Previous authors have argued that MRA cannot reliably detect subclavian steal syndrome due to lack of direction related flow information.

However, combination of imaging findings such as non-visualized flow signals and proximal subclavian changes on MRA should raise suspicion for subclavian steal with reversal of flow.

Clinical symptoms and signs can also help narrow down the differentials especially if associated with weak/reduced pulse as well as exercise induced pain/fatigue along ipsilateral upper limb.

3.4 Learning points

- Time of flight MRA is a flow related sequence
- Flow reversal or slow flow can both cause non visualization of vessel

- Strong suspicion of flow reversal/ subclavian steal syndrome in cases of non-visualization of vertebral artery signal if coexistent with subclavian changes
- Doppler ultrasound is an easily available investigation to differentiate and diagnose subclavian steal phenomenon
- Clinical indicators can help raise suspicion especially if exercise induced
- Luminal studies (CTA/DSA) help in confirmation and treatment planning.

References

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