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Letter to the Editor: New Observation

Mechanical Thrombectomy in Takayasu Arteritis by Direct Carotid Puncture

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Takayasu arteritis (TA) is a large-vessel vasculitis that mainly affects the aorta and its major branches.[1] It is most commonly seen in young females, with the highest prevalence in Asian countries.[2] Its clinical manifestation includes constitutional symptoms, limb claudication, angina, hypertension, and absent peripheral pulses. It has been estimated that 10%–20% of people with TA exhibit neurological manifestation.[3] Involvement of the common carotid and vertebral artery causes progressive neuro-ischemic symptoms such as visual disturbance, headache, vertigo, syncope, and transient ischemic attacks. However, acute stroke with large-vessel occlusion as a first manifestation of TA is rare.[4]

A 25-year-old female without any significant past history presented to our emergency room with complaints of sudden-onset weakness of the right upper and lower limb associated with difficulty in speech for the last two and a half hours. On examination, her blood pressure was 100/70 mmHg in left arm and 85/60 mmHg in right arm supine position. Her NIH Stroke Scale (NIHSS) score was 9 with computed tomography (CT) brain ASPECT score of 8. A thrombotic occlusion was observed in the M1 segment of the left middle cerebral artery (MCA). CT angiogram also revealed a concentric wall thickening of the arch of aorta and arch vessels. The innominate, right common and internal carotid, left proximal common carotid, and right proximal subclavian arteries were completely occluded (Figure 1). All of the American College of Rheumatology criteria of TA were met, which included (1) age < 40 years at the onset of symptoms, (2) decreased brachial artery pulse, (3) blood pressure difference of >10 mmHg between the two arms, (4) limb claudication, (5) bruits over the subclavian artery, and (6) angiographic evidence of narrowing or occlusion of the aorta or its primary branches. The presence of three or more of these criteria confirms the diagnosis of TA with specificity and sensitivity above 90%.[5] As she presented within the window period, she underwent IV thrombolysis with alteplase (0.9 mg/kg) and was shifted to the Neuro Cathlab suite for mechanical thrombectomy (MT). Under general anesthesia, with her neck in the extended position, the reformed left distal common carotid artery (CCA) was punctured just below the carotid bifurcation by using a 20-gauge micropuncture needle from the Terumo Radifocus introducer set under ultrasound guidance and entry. However, the 0.025″ microwire went to the external carotid artery (ECA), as the needle pointed in the direction of ECA. So, the 6-F 7-cm introducer sheath (Terumo Radifocus) was secured in the ECA. Using the dual wire technique, the same sheath was repositioned into the internal carotid artery (ICA). Sheath angiogram confirmed the thrombotic occlusion of left M1 MCA (Figure 2). An ACE 68 (Penumbra, Inc. USA) aspiration catheter was navigated over a Rebar 18 (ev3 Neurovascular, USA) microcatheter and Synchro (Stryker Neurovascular, USA) 0.014″ microwire. The thrombus was traversed and a Solitaire-2 (ev3 Neurovascular, USA) 4 × 40-mm stent retriever was deployed across the thrombus by the push and fluff technique. After a dwell time of 5 min, both were retrieved simultaneously under negative suction using the Solumbra technique. Complete recanalization was achieved with grade 3 thrombolysis in cerebral infarction (TICI) score. The puncture to recanalization time was 58 min. Hemostasis was achieved by manual compression of the puncture site for 10 min. Post-procedure neurological examination revealed complete recovery of the limb weakness with an NIHSS score of 2. She was started on dual antiplatelets after ruling out hemorrhage based on 24-h CT image of the brain. During the workup, her inflammatory markers were elevated with a CRP level of 36.30 ml/L and an erythrocyte sedimentation rate (ESR) level of 84 mm (1 h). Her echocardiogram and holter monitoring were normal. Autoimmune workup and other vasculitis panel were also negative. Oral steroid and immunosuppressant (mycophenolate mofetil) were added after rheumatology consultation, and the patient was discharged with a modified ranking scale (MRS) of zero. On 3-month follow-up, she was asymptomatic without any neurological deficits.

TA is a chronic inflammatory arteriopathy of unknown origin. The pathology of this condition results in stenotic changes in the vessel lumina and thrombus formation. Rapid disease progression sometimes leads to aneurysm formation secondary to inadequate fibrosis or due to inflammation-mediated mural stress.[6] The prevalence of neurovascular symptoms in patients with TA has been estimated to be around 10%–20%.[3] Transient ischemic attack, or stroke in TA, can be attributed to the following mechanisms:

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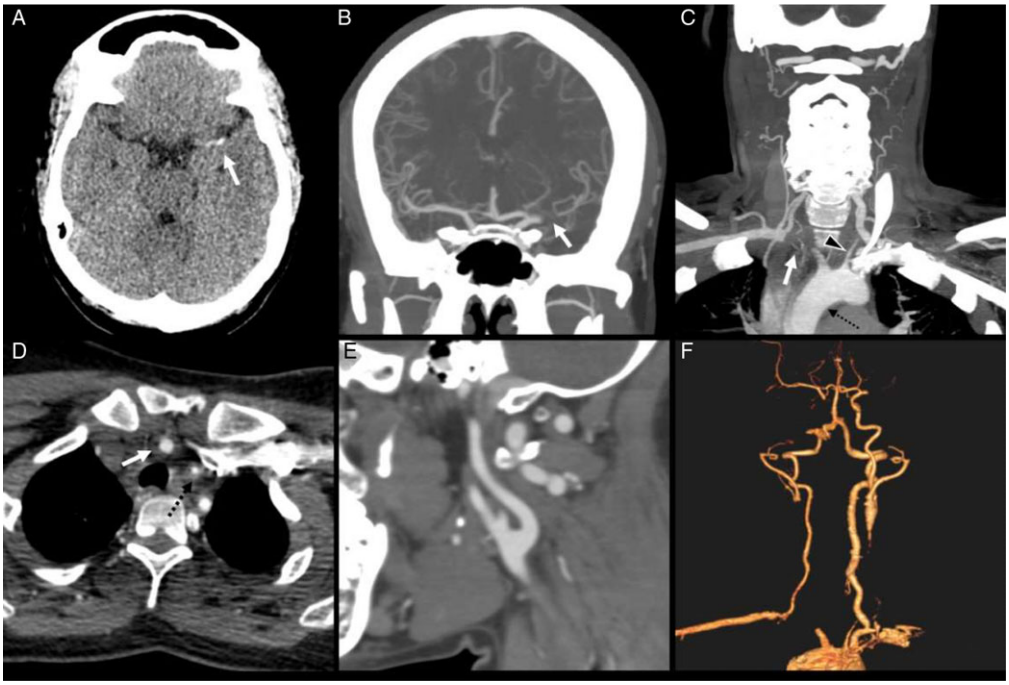

Figure 1: (A) Axial non-contrast CT brain at admission reveals a hyperdense left MCA (arrow). (B) Coronal multiplanar reformation (MPR) image of CT brain angiogram demonstrates left MCA occlusion (arrow). (C) Coronal reformation of the CT angiogram at neck level shows occlusion of the right innominate artery (arrow) with gradual smooth tapering of left common carotid artery (arrow head); aortic arch also shows smooth circumferential wall thickening (dotted arrow). (D) Axial section of CT angiogram at the neck level shows symmetrical circumferential thickening of right innominate (arrow) and left carotid vessel wall with narrowing of the lumen (dotted arrow). (E) Sagittal MPR image shows complete occlusion of the distal left common carotid artery with reformation of carotid bifurcation. (F) 3D-VRT (volume rendering technique) image showing complete occlusion of right innominate and bilateral carotid vessels.

Figure 2: (A) Coronal MPR image of intravenous Vaso CT of Brain at Cath lab suite reveals a left MCA occlusion (arrow). (B) Digital substraction angiogram (DSA) by direct percutaneous puncture approach to left common carotid artery, showing arterial sheath in left ECA, which was manipulated and navigated into left internal carotid artery (ICA) (C) using dual-wire technique. (D) Left ICA angiogram frontal projection demonstrates left M1 MCA occlusion (arrow). (E) ACE 68 aspiration catheter (arrow) is used as guiding and using Rebar 18 microcatheter-Synchro 0.014'' microwire (arrow head) combination, the MCA occlusion is crossed. (F) Using Solitaire 4x40 mm stentriever (arrow), the thrombus is removed in first pass, achieving modified thrombolysis in cerebral infarction (mTICI) 3 flow (E). (H) Removal of 6-French arterial sheath from the left carotid vessel and achieving hemostasis by manual compression.

(a) hemodynamic imbalance due to proximal steno-occlusion; (b) arterio-arterial embolism; and (c) cerebral vasculitis.[7] No consensus prevails currently regarding the choice of intervention for extracranial carotid artery stenosis or occlusion in TA. Direct carotid puncture is a described technique for MT in difficult aortic arch or occlusion in aorto-iliac vessels or subclavian arteries. This technique is safe and effective with a success rate of >90%. The complications described in the literature are neck hematomas, airway compromise, non-flow-limiting CCA dissections, and rarely delayed fatal carotid blowout.[8]

Few case reports of MT in TA are available where the authors performed MT through transfemoral access by recanalizing the CCA.[3,6] Owing to vessel wall fragility during the active phase and high rates of reocclusion, angioplasty and stenting are not always the first option for the carotid occlusion in TA. Up to 62% of cases of stenting in TA can have restenosis/reocclusion as the most common late complication. Also, active disease at the time of intervention is an important risk factor for vessel wall rupture or reocclusion after the revascularization procedure.[9] For symptomatic restenosis with active disease, invasive measures should be delayed for an inactive period whenever feasible. The safety of the use of emergency carotid artery stenting is uncertain mainly due to the need for periprocedural antithrombotic agents, which could increase the risk of hemorrhagic complications. A trans-circulatory approach via left posterior communicating artery is an alternative approach for thrombectomy. It is usually reserved to access the target lesion when the parent artery cannot be crossed through conventional antegrade routes. However, in view of faint

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visualization of the posterior communicating artery in CT angiogram, we chose the direct carotid approach.

Large-vessel occlusion stroke, though rare, can be the first manifestation of TA. The role of IV thrombolysis in this subgroup of patients is not well known. Direct carotid puncture for MT is a safe and effective alternative in TA patients with significant proximal carotid disease.

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