Subclavian steal syndrome

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History

A 63-year-old male patient presented himself to the hospital, after a sudden onset of syncope, for a check-up. A Dual Energy (DE) CT angiography (CTA) was performed on a Dual Source CT (DSCT), SOMATOM Pro.Pulse, to rule out suspected bilateral carotid artery stenoses.

Diagnosis

CTA images revealed a segmental occlusion of the left subclavian artery (SA), immediately distal to the origin, proximal to the vertebral artery, over a distance of approximately 2.5 cm. Regular contrast was seen in the distal left SA, presumably via retrograde filling of the left vertebral artery (VA), causing subclavian steal syndrome (SSS). The brachiocephalic trunk (BCT) and the left common carotid artery (CCA) shared a common origin, showing a variation of a Bovine aortic arch. A slight stenosis, caused by a non-calcified plaque, was seen in the left CCA. The right internal carotid artery (ICA) was severely stenosed close to its origin and continued its course with filiform contrast filling. The origins of the bilateral VAs were slightly stenosed, with regular contrast enhancement in the further courses. There was no significant stenosis of the left ICA. A proximal occlusion of the right middle cerebral artery (MCA), previously diagnosed, was visualized.

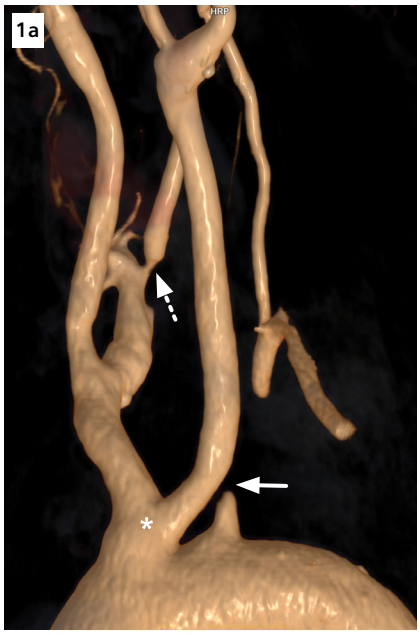
Comments

SSS is caused by severe proximal SA stenosis or occlusion, which occurs proximally to the VA, resulting in the reversal of blood flow from the ipsilateral VA, stealing blood from the posterior cerebral circulation. Patients with adequate intracranial collateral circulation are usually asymptomatic; however, during arm exercise, neurological symptoms such as syncope or presyncope, can result due to cerebral hypoperfusion. Symptoms associated with decreased perfusion to the ipsilateral extremity can also occur depending on the situation. CTA, being non-invasive and easily accessible, is performed to identify vascular stenosis and occlusion, as well as the causes, such as calcified or non-calcified atheromatous plaques. DECT additionally enables the simultaneous image acquisition at two different energy levels. These images can be used to enhance the contrast-to-noise ratio by displaying the virtual monoenergetic images at a lower keV level (55 keV in this case), as well as to remove the bony structures for non-obscured visualization and better assessment of the vascular lumen. In this case, a complete craniocervical CTA is acquired in only 3 seconds, providing information about multiple stenoses and occlusion of the craniocervical arteries, confirming the diagnosis of a SSS as the suspected cause of the patient's syncope. ●

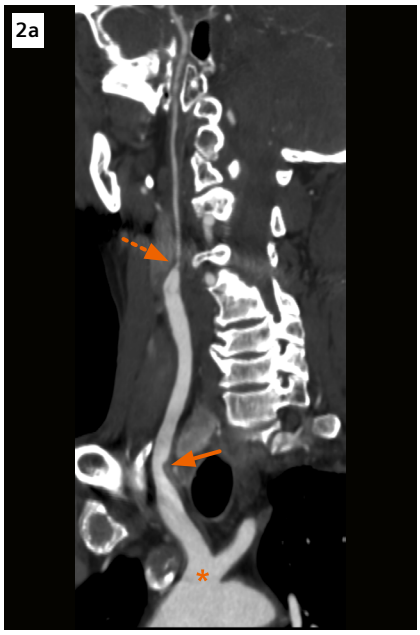
Examination Protocol

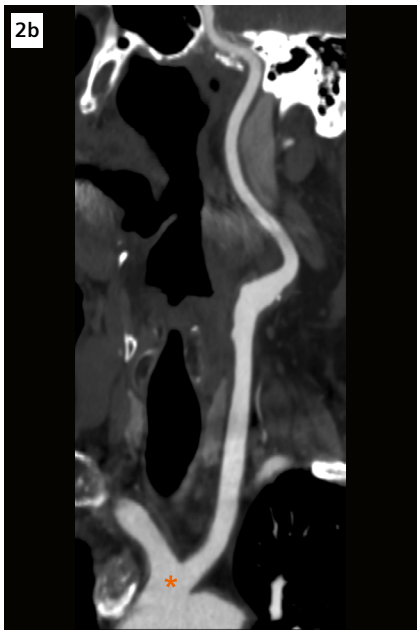
Scanner	**SOMATOM Pro.Pulse**
Scan area	Head and neck
Scan mode	Dual Energy
Scan length	276 mm
Scan direction	Caudo-cranial
Scan time	3 s
Tube voltage	80 / Sn140 kV
Effective mAs	157 / 141 mAs
IQ level	145
Dose modulation	CARE Dose4D
$CTDI_{vol}$	11.1 mGy
DLP	343 mGy*cm
Rotation time	0.33 s
Pitch	0.8
Slice collimation	64 × 0.6mm
Slice width	1.5 mm
Reconstruction increment	1.0 mm
Reconstruction kernel	Qr40, ADMIRE 3
keV level	55 keV

Contrast	**350 mg/mL**
Volume	70 mL + 40 mL saline
Flow rate	4.0 mL/s
Start delay	10 s

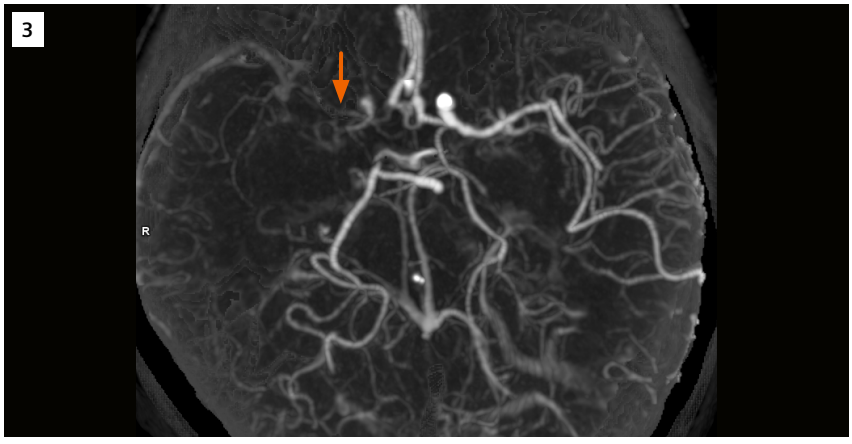


1 Cinematic VRT images show a segmental occlusion (arrows) of the left SA, immediate distal to the origin, proximal to the VA, over a distance of approximate 2.5 cm. Regular contrast is seen in the distal left SA, presumably via retrograde filling of the left VA, causing a SSS. The origins of bilateral VAs are slightly stenosed (dotted arrows) with regular contrast enhancement in the further courses. A Bovine aortic arch (asterisks) is also present.





2 MPR images show a slight stenosis, caused by a non-calcified plaque, in the left CCA (Fig. 2a, arrow). The right ICA is severely stenosed close to its origin (Fig. 2a, dotted arrow) and continues its course with filiform contrast filling. There is no significant stenosis of the left ICA (Fig. 2b). A Bovine aortic arch (asterisks) is present.



2 A MIP image shows a proximal occlusion of the right MCA (arrow).

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The products/features (mentioned herein) are not commercially available in all countries. Their future availability cannot be guaranteed.