Images: Bilateral agenesis of the internal carotid arteries - MRI and MR angiography

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A 55-years-old woman came with sudden onset left hemiparesis for 12h, following an episode of convulsions. On admission, the power was grade 2/5 in the left upper and lower limbs. An MRI brain was performed. The MRI showed hyperintense areas in the right high frontal and parietal lobes on T2W images [Figure 1], with restricted diffusion on diffusion-weighted (DW) images [Figure 2], representing acute non-hemorrhagic infarcts. In addition, the axial spin-echo (SE) T1W and T2W [Figure 3] images revealed absence of the normal flow voids of the internal carotid arteries (ICAs) in the region of the carotid canals in the skull base. The expected regions of the carotid canals were filled with fibro-fatty tissue.

The 3D time-of-flight (TOF) MRI angiography (MRA) images [Figures 4, 5] demonstrated prominent posterior cerebral arteries supplying both the anterior circulations through the posterior communicating arteries. The axial raw data (source images) [Figure 6] confirmed the absence of flow signals in the expected location of the ICAs on either side. No other vascular abnormality was seen in the form of aneurysm or focal stenosis.

Subsequently, the patient was managed with anticoagulant therapy, to which she responded favorably. No complications were encountered during her hospital stay till her discharge after nine days. She left with mild residual weakness in the left upper and lower limbs.

Discussion

Absence of the internal carotid artery (ICA) is a rare congenital anomaly, which may be the result of an acquired
disease (common), congenital hypoplasia (uncommon) or congenital aplasia (rare). This is more commonly seen unilaterally. Most reported cases of bilateral absence have been recorded prior to 1980. Previous reports have been largely based on catheter angiography. In 1954, the first case of ICA agenesis at cerebral angiography was reported.

**Figure 3:** Axial T2W image taken through the skull base at the level of the carotid canals showing absence of flow voids in the expected region of the carotid canals bilaterally (white arrows). The normal flow void of the basilar artery is well seen.

**Figure 4:** A MIP images of 3D TOF MRA. The oblique antero-posterior projection image shows absence of the internal carotid arteries bilaterally and prominent vertebral (black arrows), basilar (white arrow) and posterior cerebral (short thick black arrows) arteries.

**Figure 5:** The left lateral projection image shows the absence of internal carotid arteries bilaterally and prominent vertebral (black arrows), basilar (double arrows), posterior cerebral and posterior communicating (white arrow) arteries supplying the anterior circulation.

**Figure 6:** Axial raw data images (source images) showing the prominent posterior communicating artery (arrow) supplying the anterior circulation on the left side. The internal carotid arteries are absent on both sides.
Lie described six pathways of collateral circulation in association with absence of the ICA. Others have simplified Lie’s original classification of collateral circulation in absent ICAs into three main types: collateral flow through the circle of Willis (most frequent and also seen in the present case); collateral flow via persistent fetal circulation and reconstitution of the ICA through skull base collaterals from the ECA.

The MRA in this case demonstrated supply to the anterior circulation via enlarged posterior communicating arteries, the most commonly seen collateral arrangement.

References


