Case 5367

High Grade Stenosis of Internal Carotid Artery

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Patient: 69 years, male

Clinical History:
A high grade stenosis of internal carotid artery in a 69 year-old male patient, with an episode of lipotimia.

Imaging Findings:
A 69 year-old male patient was referred to our department after an episode of a lipotimia, to perform a Doppler ultrasound examination of the extracranial cerebral circulation. A stenosis was found in the proximal portion of the left internal carotid artery (ICA), showing spectral broadening and a peak systolic velocity (PSV) of 255.2 cm/s (figure 1). In the common carotid artery the flow was of high resistance, with a peak systolic velocity of 61.5 cm/s, corresponding to a ICA/CCA PSV ratio of 4.15 (figure 2). Distal to the stenosis, the peak systolic velocity was reduced (parvus), with a slow systolic rise time (tardus) (figure 3). The left ophthalmic artery showed reversed flow (figure 4). These findings correspond to a high-grade stenosis of the left internal carotid artery (>70%).

Discussion:
Stenosis is typically an area of narrowing caused by plaque, with a focal area of increased velocity and a poststenotic disturbed flow. The ICA PSV and the presence of plaque on gray-scale and/or colour Doppler US images are the primary parameters that should be used when diagnosing and grading ICA stenosis. (1) ICA PSV are normally 80 to 100 cm/s in younger patients and 60 to 80 cm/s in older patients. The PSV at an ICA stenosis increases as the severity of the stenosis increases and is proportional to the degree of the lumen diameter narrowing until a degree of stenosis of 90% is reached. (2) ICA/CCA PSV ratio and ICA end-diastolic velocity (EDV) should be used when ICA PSV may not be representative of the extent of the disease owing to technical or clinical factors such as in the presence of tandem lesions, contra lateral high-grade stenosis, discrepancy between visual assessment of plaque and ICA PSV, elevated CCA velocity, hyperdynamic cardiac state or low cardiac output. (1) The ICA/CCA PSV ratio is obtained by dividing the PSV in the ICA by the PSV measured in the CCA approximately 2cm from the carotid bulb. The ratio should be less than 2.0 (some researchers use 1.8). (2) Published literature is replete with velocity thresholds for categorizing ICA stenosis. A consensus panel in 2003 defined that a >69% ICA stenosis but less than near occlusion of the ICA is diagnosed when the ICA PSV is greater than 230cm/s and visible plaque and luminal narrowing are seen at grey-scale and colour Doppler US. Additional criteria include ICA /CCA PSV ratio > 4 and ICA EDV >100cm/s. (1) Another way to confirm the severity of the stenosis is confirming altered periorbital collateral blood flow around the eye with periorbital Doppler signals or by evaluating the direction of blood flow on ocular scanning. Both tests will likely be abnormal with severe degrees of carotid stenosis. (2)

Differential Diagnosis List: High-grade stenosis of the internal carotid artery
Final Diagnosis: High-grade stenosis of the internal carotid artery

References:


Description: Left internal carotid artery. Stenosis with a high PSV and spectral broadening. Origin:
Figure 2

Description: Left common carotid artery. High resistance flow. Origin:
Description: Left internal carotid artery. Distal to the stenosis one could see a “tardus parvus” waveform. Origin:
Figure 4

Description: Left ophthalmic artery. Reversed flow. Origin: