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# Detection of subclavian steal syndrome by Doppler ultrasound in hemodialysis patients

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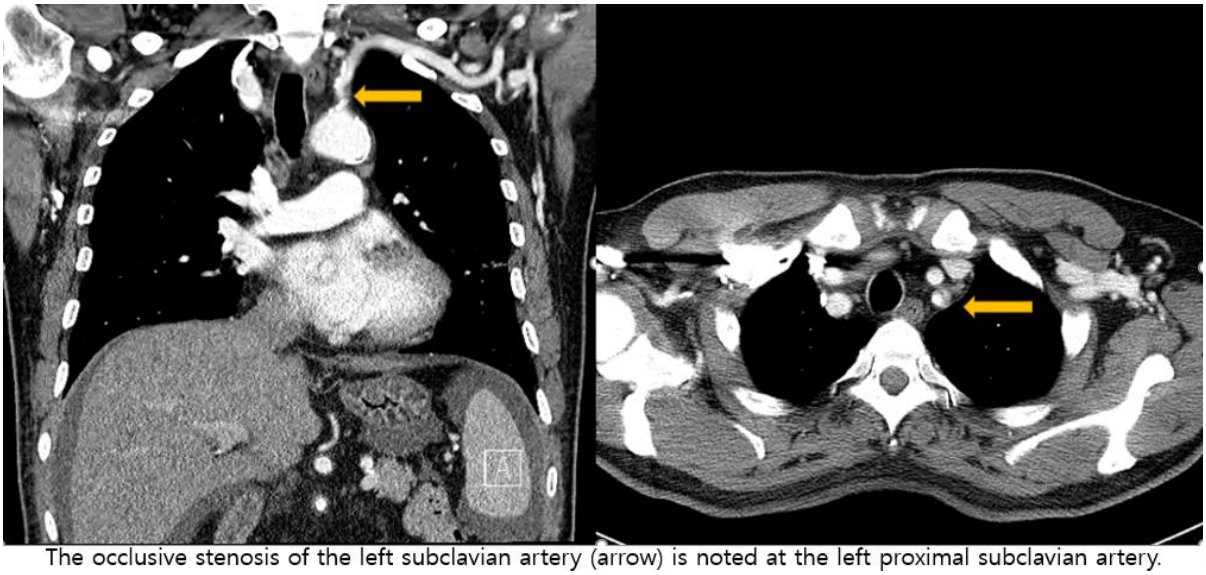
**Objectives:** For hemodialysis (HD) patients with arteriovenous (AV) access, the Doppler ultrasound (DUS) parameters of the brachial artery (BA) without AV access cannot be referenced because huge hemodynamic changes develop after an arteriovenous (AV) access placement. We present normal distributions of DUS parameters of the BA in the arm with AV access and introduce a case diagnosed as a proximal arterial occlusive disease via the reference to the values.

**Methods:** From January 3, 2019, to May 25, 2021, functional parameters of DUS examined in the 497 HD patients were investigated by retrospective analysis. Based on the results, a case of subclavian steal syndrome (SSS) was diagnosed and treated with stent placement.

**Results:** The mean ± standard deviation (σ) of blood flow in the brachial artery (Qa), resistive index (RI), acceleration index (ACC), acceleration time (AT), and AT/time of a single cardiac cycle (AT/CC) were 882.2 ± 514.2 ml/min, 0.53 ± 0.12, 705.2 ± 288.7 $cm/s^2$, 0.13 ± 0.04s, 0.019 ± 0.005, respectively. The ACC has a negligible correlation ($r = -0.1$) to Qa and can be a reliable parameter regardless of the change of Qa. During the study period, a patient presented with the RI 0.38, ACC 373.0 $cm/s^2$, AT 0.19 s, AT/CC 0.028, documented outside the 1σ of the mean value. The intermittent dizziness of the patient was evaluated by computed tomography of the proximal arteries, which revealed occlusive stenosis of the subclavian artery. The abnormal results were improved to the normal range of reference values after stent placement at the stenosis

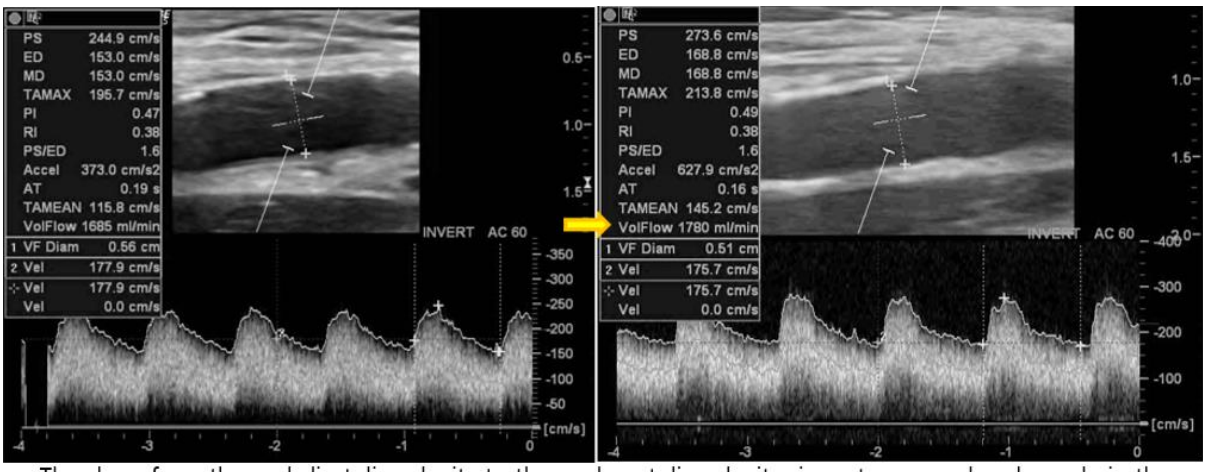
**Conclusions:** This study provides the reference values of the functional DUS parameters in the arm with AV access. It would be helpful for the identification of SSS in the HD patients, in whom the comparison of blood pressures between the bilateral arms is not feasible mostly.

The computed tomography of the proximal arteries



The occlusive stenosis of the left subclavian artery (arrow) is noted at the left proximal subclavian artery.

The change of functional parameters and spectral waveforms of Doppler ultrasound examination for brachial artery




The slope from the end-diastolic velocity to the peak systolic velocity rises at a more sharply angle in the spectral waveforms of pulsed-wave Doppler ultrasound after treatment of subclavian artery stenosis (Right) compared to before the treatment (Left). The Acceleration index increased from 373.0 to 627 cm/s2 and the acceleration time decreased from 0.19 to 0.16 s