

Supplementary Material

Illustrative Case Studies

Case 1. A patient with known bilateral internal carotid artery stenosis of less than hemodynamic significance (<50% diameter-reducing stenosis) returns to the vascular laboratory for surveillance examination. There is no evidence of disease progression on the right side. On the left side, the sonographer noted in the report to the interpreting physician the presence of heterogeneous calcific atherosclerotic plaque which was shown on the submitted gray scale images of the left mid-common carotid artery. The physician noted the absence of alteration of the Doppler spectral waveforms recorded proximal to, within the diseased area, and distal to the lesion. Extensive acoustically heterogeneous, calcified plaque was shown in the gray scale images of the left carotid bifurcation (Figure CSI-A). Antegrade flow was present in the proximal left internal carotid artery with monophasic, low resistive waveforms exhibiting pronounced spectral broadening, and peak systolic velocity exceeding 248 cm/s (Figure CSI-B). The velocity decreased to 159 cm/s distal to the lesion. Flow remained antegrade with a monophasic low resistive Doppler spectral waveform pattern (Figure CSI-C). Compared to the previous duplex ultrasound examination, the interpreting physician noted that these findings were consistent with progression of left internal carotid artery stenosis to hemodynamic significance.

Case 2. A peripheral arterial duplex ultrasound examination is performed for surveillance for known superficial femoral artery disease. As part of the complete examination, the sonographer obtains Doppler spectral waveforms and gray scale images at multiple levels along the length of the common femoral, profunda femoris, superficial femoral, and popliteal arteries. The interpreting physician notes that there is atherosclerotic plaque in the images from the common femoral artery with associated increased velocity. The Doppler waveforms recorded in the proximal superficial femoral artery have a

prolonged systolic upstroke and continuous forward flow in diastole (Figure CS2-A). Also noted is an increased burden of plaque in the mid superficial femoral artery (Figure CS2-B) compared to the previous examination and that the peak systolic velocity quadruples in that segment of the artery. The waveforms beyond the point of highest velocity are described as having more prolonged upstroke with continuous forward flow in diastole (Figure CS2-C). Utilizing waveform description and velocity information, the following conclusion is made. "There is a greater than 75% stenosis in the mid superficial femoral artery. Additional significant stenosis in the common femoral artery is indicated by delayed systolic upstroke in the waveforms recorded in the mid superficial femoral artery."

Case 3. A patient with retroperitoneal sarcoma and left lower limb swelling was referred to the vascular laboratory with a request for a bilateral lower extremity venous ultrasound examination. The sonographer's findings noted that all veins distal to the inguinal ligament compressed completely in both lower extremities. Gray scale imaging demonstrated no evidence of intraluminal echoes suggesting venous thrombosis in any visualized venous segment in either limb. Normal venous respirophasicity was noted in the Doppler waveforms from the right common femoral vein (Figure CS3-A), while the waveforms from the left common femoral vein were continuous and non-phasic (Figure CS3-B). Based on the abnormal waveform characteristics in the left common femoral vein, the sonographer extended imaging into the left external and common iliac veins but was unable to record satisfactory images due to excessive abdominal gas. The physician interpreter stated that the ultrasound images and waveforms indicated a normal right lower extremity venous evaluation. The grayscale images did not demonstrate deep vein thrombosis in the left lower limb and the veins were compressible; however, the Doppler waveforms were abnormal and indicated likely obstruction to venous return above the level of the left common femoral vein. These findings can be due to extrinsic compression or thrombosis of the proximal veins.

Figure Case Study-1

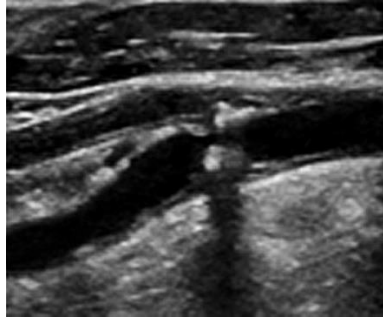


Figure CS1-A

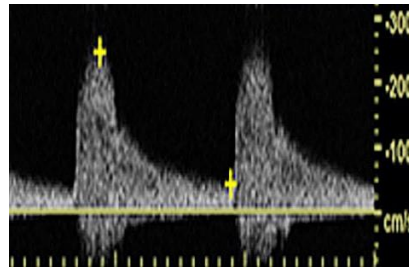


Figure CS1-B

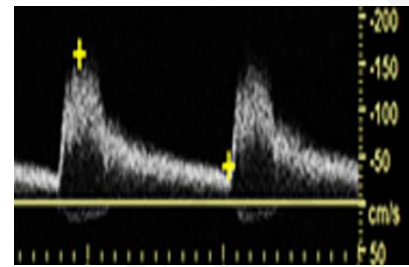


Figure CS1-C

Figure C S1-A Gray scale image of the left carotid bifurcation with acoustic shadowing from heterogeneous, calcified plaque.

Figure C S1-B: Spectral Doppler waveform of the proximal left internal carotid artery at the site of the lesion demonstrates antegrade monophasic, low resistive waveforms with spectral broadening, and peak systolic velocity of 248 cm/s

Figure C S1-C: Distal to the lesion, spectral Doppler waveform of the left internal carotid artery demonstrates antegrade, monophasic low resistive pattern

Figure Case Study-2

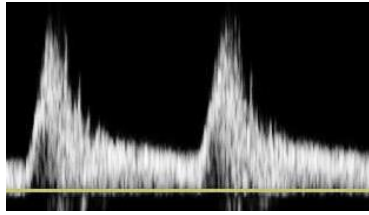


Figure CS2-A



Figure CS2-B

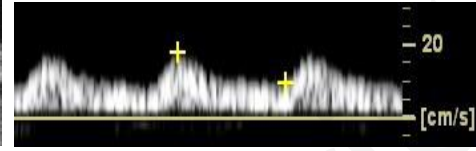


Figure CS2-C

Figure C S2-A: Spectral Doppler waveform demonstrates prolonged systolic upstroke and continuous forward flow in diastole in the mid superficial femoral artery.

Figure C S2-B: Gray scale image demonstrates plaque in the mid superficial femoral artery

Figure C S2-C: Spectral Doppler waveforms distal to the site of highest velocity from plaque lesion demonstrates more prominent prolonged upstroke with continuous forward flow in diastole.

Figure Case Study-3

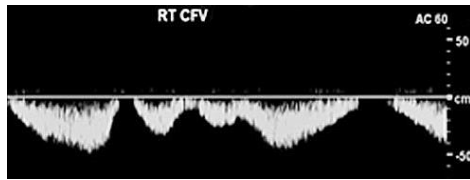


Figure CS3-A

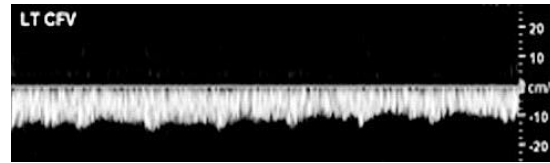


Figure CS3-B

Figure C S3-A: Spectral Doppler demonstrates spontaneous respirophasic waveform in the right common femoral vein.

Figure C S3B: Spectral Doppler demonstrates spontaneous continuous waveform in the left common femoral vein.