SO YOU THINK YOU KNOW YOUR VASCULAR DISEASES

A game to test how much you know

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HOW TO PLAY

1. Play as a Group or Individual
2. Create your Game Name
3. Choose all that apply
4. Text your answer to:
   (248) 703 2922

First Person/ Group to answer Correctly WINS
THE PRIZE

Saunders

Handcrafted Chocolates
Doppler Waveforms of Venous flow
QUESTION 1.

These are all Venous Doppler waveforms. Which Vein has a waveform pattern suggestive of a hemodynamic abnormality?

A                B
(remember more than one may be correct)

A.   IVC
B.   Hepatic Vein
C.   CFV
D.   Subclavian Vein
Flow direction in this ABNORMAL IVC Waveform is mostly **AWAY** from the Heart

NORMAL IVC Waveform should be seen as **TOWARD** the heart

Reference-

https://pubs.rsna.org/doi/pdf/10.1148/rg.297095715

Flow direction in this ABNORMAL Lower extremity Waveform has flow that is highly PULSATILE

NORMAL Lower extremity Waveform should be seen as Non- Pulsatile

Reference:
Increased Central Venous Pressure has an impact on waveform patterns below the diaphragm.

Upper extremity veins, are closer to the heart and will have pulsatile waveforms – with predominately antegrade flow TOWARD the heart.

Hepatic Vein flow is biphasic with predominantly antegrade flow with 4 inflection points.

Lower extremity veins are generally NON-PULSITILE. Pulsatile flow of the lower extremity veins SUGGEST increased central venous pressure.
QUESTION 2.

Which image(s) demonstrate flow reversal of the ECA?

A
B

A.

B.
B is the answer
Pay attention to the Color orientation

In this image, the ECA is going in the \textbf{REVERSED} direction

In this image, the ECA is going in the \textbf{CORRECT} direction
The Hemodynamics that cause Reversed Flow in the ECA

- Occlusion of the common carotid artery (CCA) is generally associated with occlusion of the ipsilateral internal carotid artery (ICA) and external carotid artery (ECA).

- **Sometimes**, however, collateral circulation to the ECA may preserve patency of the ICA via retrograde perfusion through the bulb.

- This collateral flow can be maintained through ECA anastomotic branches such as:
  - superior and inferior thyroidal arteries
  - deep cervical artery
  - descending branch of occipital artery
  - superior and inferior labial arteries
  - or an aberrant ICA branch

Reference:  https://pubs.rsna.org/doi/pdf/10.1148/rg.256045013
Question 3.

Which image has the flow characteristics of an AV fistula?

A
B
C
C is the answer

- Spectral Doppler of an artery proximal to a fistula shows high velocity flow with an increase in diastolic flow.
- Additional signs of fistula would be ‘arterialization’ of the adjacent vein.
- Communication between artery and vein can sometimes be difficult to image.
- A tissue bruit due to high flow velocity may be seen in AV fistulas.

Reference:
- https://www.ajronline.org/doi/10.2214/AJR.09.3978
CFV Flow
Question 4.

Which image has the flow characteristics of a patient with May-Thurner Syndrome?

A. 
B. 
C. 

AUGMENT
May-Thurner Syndrome is also known as Iliac vein compression syndrome. Anatomically the **RIGHT** iliac artery compresses the **LEFT** iliac vein causing an outflow obstruction and increases the risk for DVT of the **left extremity**.

Many Sonographers miss the subtle signs of this condition because the CFV and all other deep veins will be compressible. However if you look closely at the flow pattern, there will be a continuous wave pattern without response to respiration.

Other conditions that can cause monophasic venous flow are patients with chronic deep Venous disease.

Reference: [https://www.ardms.org/may-thurner-syndrome-what-sonographers-should-know/](https://www.ardms.org/may-thurner-syndrome-what-sonographers-should-know/)

Arterial Waveforms
Question 5.

Which waveform is suggestive of a distal occlusion?

A
B
C
D
Absence of any diastolic flow (high resistance) is a common wave pattern when the sample volume is **PROXIMAL** to an occlusion.

The amount of diastolic flow detected will vary depending on the vessel being examined. Example: CFA with SFA occlusion could still have components of the open PFA.

Think of flow ‘hitting a brick wall’

Reference: 
[https://pdfs.semanticscholar.org/1c37/404c508e0d1a23e83af9d14b60df17a2b20b.pdf](https://pdfs.semanticscholar.org/1c37/404c508e0d1a23e83af9d14b60df17a2b20b.pdf)  
[http://rihuc.huc.min-saude.pt/bitstream/10400.4/1507/1/Occlusion%20or%20Near-Occlusion%20of%20the%20ICA.pdf](http://rihuc.huc.min-saude.pt/bitstream/10400.4/1507/1/Occlusion%20or%20Near-Occlusion%20of%20the%20ICA.pdf)
Vertebral Artery Waveforms
Question 6.

Identify the abnormal vertebral artery flow waveform(s)?

A. 

B. 

C. 

(Recall there may be more than one answer)
A & B & C is the answer

- The normal vertebral artery has sustained diastolic flow – similar to the ICA waveform
- A is an example of a Resistive waveform is suggestive of distal vertebrobasilar disease
- B is an example of tardus parvus waveform is suggestive of significant stenosis proximal to the segment sampled
- C is a Reversed waveform and is consistent with subclavian steal

Lower Extremity
Question 7.

Which Image(s) suggest abnormal vein(s)?

A
B
C
A & C is the answer

- Perforator Veins move superficial venous flow to deep veins. Look for veins that ‘perforate’ (break through) the posterior fascia of the leg muscles.
- Tributary (Varicose) veins may be seen within the fascial compartment and Anterior to the fascial compartment.
- Do not mistake muscle tears for a thrombosed vein

Renal Artery Waveforms
Question 8.

Which renal artery has characteristics of a normal waveform?

A  
B  
C  
D
A, B, C, & D is the answer

- All these wave forms have a visible ESP
- The early systolic peak (ESP) is seen as a small notch in systole in the normal renal and intrarenal arterial waveform.
- The systolic upstroke is rapid with an acceleration of .07 seconds or less.
- The ESP is an indirect way to suggest normal flow in a Renal Artery

https://pdfs.semanticscholar.org/8a10/03bddeaa0eb241b0b7ad5c1d956efd6571a2.pdf?_ga=2.82122069.2118993556.1567035278-316834844.1549248474
Question 9.

The right ICA has trickle flow. What would the flow response be in the contralateral ICA?

? 165 cm/sec

Peak Velocity
165 cm/sec
Compensatory Flow due to contralateral Stenosis
Flow will be increased in the contralateral ICA

- Some patients with significant stenosis of one cerebral vessel will have a compensatory increased flow volume in the contralateral cerebral vessel.

- When correlating carotid duplex exams with other imaging modalities, correlation will be 100% in the more significant ICA stenosis, yet non-correlation may occur with the contralateral ICA.

- When faced with this scenario, the sonographer may want to add this qualifier to your tech work sheet:

  Flow velocity of the ICA is consistent with 50-69% stenosis however, increased velocity may not be due to stenosis and compensatory flow should be considered based on critical stenosis of the contralateral ICA.

WE ARE THE CHAMPIONS