

# LIVER TIPS DOPPLER ULTRASOUND PROTOCOL (UABDD)

(UABDD is a combined charge of UABDL and UORGDC. If you are doing a Complete Abdomen Exam, will need to change the charge to UABDC and UORGDC separately.)

**\*\*INCLUDES AN ABDOMEN LIMITED EXAM WITH COLOR AND SPECTRAL DOPPLER OF TIPS, PORTAL VEINS, HEPATIC ARTERIES, HEPATIC VEINS, AND SPLENIC VEIN.\*\***

**PATIENT PREP: NPO at least 4 hours. Exceptions can be made for urgent and ER exams. Include in the report that the patient was not NPO for exam when relevant.**

**INCLUDE IN THE PATIENT HISTORY SECTION OF THE REPORT –**

- Placement or revision date
- Baseline velocities
- TIPS location

## **PANCREAS:**

- Transverse image of head, body (showing splenic vein) and tail.
- Sagittal image of head, body and tail.
- Transverse image of head showing porto-splenic confluence.
- Document and measure pancreatic duct if visible.
- Take image of “Pancreas Area” if not well seen.

## **LIVER:**

### **Left lobe – subcostal/epigastric approach**

- Transverse images:
  - Left hepatic vein confluence into IVC
  - Left lobe visualizing dome of liver
  - Left lobe with left portal vein
  - Cine clip sweeping through LHL in transverse from superior to inferior
- Sagittal images:
  - Left lobe with left portal vein and ligamentum teres.
  - Left lobe with hepatic vein
  - Cine clip sweeping through LHL in sagittal from medial to lateral

### **Caudate lobe – subcostal/epigastric approach**

- Sagittal image of the caudate lobe.
- Transverse image of the caudate lobe.

## Right lobe - subcostal or intercostal approach

- Sagittal images:
  - Right lobe to visualize dome of liver
  - Right liver with middle hepatic vein draining into IVC
  - Main interlobar fissure with gallbladder and CHD and MPV
  - Right lobe and right portal vein.
  - Right hemidiaphragm to assess for pleural effusions and ringdown.
  - Right lobe showing echo texture between liver and right kidney.
  - Right lobe and right kidney documenting approximate liver size. Measurement of length of the liver is not needed unless requested.
  - Cine clip sweeping through RHL in sagittal from medial to lateral
- Transverse images:
  - Right lobe showing right and middle hepatic veins.
  - Right lobe at right portal vein.
  - 2D image through MPV
  - COLOR image of MPV showing patency and direction of flow
  - Right lobe and right kidney.
  - Cine clip sweeping through RHL in transverse from superior to inferior

**TIPS IMAGES-** 2D images showing entire course of the shunt

## COLOR DOPPLER IMAGES- (Be sure to optimize your color image.)

- Color images of MPV, Right PV and Left PV showing direction of flow.
- Color image of the splenic vein at the pancreas showing direction of flow.
- Color image of the TIPS in all three locations with appropriate scale settings -proximal, mid and dist. Look for any areas of aliasing or lack of color filling.
- Color image documenting any collateral or varices if present in periportal area, LUQ, epigastric region, or the presence of a recanalized umbilical vein.

## SPECTRAL DOPPLER IMAGES: (Be sure to optimize your spectral doppler images.)

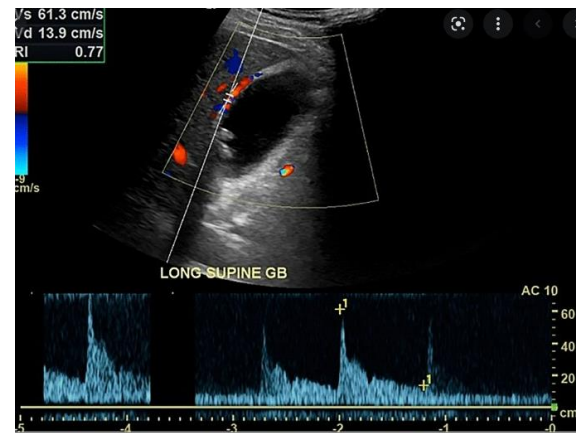
- Main, Right and Left Portal Veins - angle corrected velocity measurement.
  - Normal MPV range when a TIPS is present is >30 cm/sec with **hepatopetal** flow.
  - LPV and RPV should have **hepatofugal** flow
- Proximal, Mid and Distal TIPS - TWO angle corrected velocity measurement at each location.
  - One velocity measurement with color doppler
  - One velocity measurement without color doppler
  - Normal TIPS ranges –
    - Less than 190cm/sec and more than 50 cm/sec
    - Abnormal if velocities increase more than 60 cm/sec from baseline or decrease more than 40 cm/sec from baseline.
- Middle, Right and Left Hepatic Veins – Spectral waveform only, velocity is not needed.
  - Phasicity of hepatic veins should be assessed during suspended/mid respiration or shallow breathing, deep inspiration may dampen hepatic flow.
  - If monophasicity is seen, use LLD positioning to reassess.
- Proper, Right and Left Hepatic Arteries – Measurement of RI with angle correction and showing a linear segment of the artery to verify direction of flow.
  - (Normal RI range is 0.5 -0.8)
- Splenic vein at splenic hilum - angle corrected velocity measurement.

## BILE DUCTS:

- Sagittal image of CBD and CHD with and without measurements in 2D and color doppler at the level of the porta hepatis. If dilated, follow CBD as distal as possible to look for stones/mass and measure as distal as possible as well.
- Document and measure any intrahepatic bile duct dilatation with 2D and color imaging.

## GALLBLADDER:

- Sagittal image of gallbladder.
- Transverse image of gallbladder.
- Measurement of gallbladder wall in sagittal section only. Do not include liver surface. If liver edge is edematous, try to measure free GB wall. Normal wall thickness is <3mm.
- Take image and cine through GB if there is any abnormality (stones, polyp, adenomyomatosis.) Take color image of any mass seen.
- LLD POSITION: Transverse and sagittal image of gallbladder with patient in LLD position to check for stones/polyps and mobility.
- If evaluating for cholecystitis, or if suspicious GB findings such as thickened wall or distension:
  - Evaluate for Murphy's sign and include in the report.
  - Gallbladder length measurement. Normal <8cm
  - Color doppler of gallbladder wall to assess for hypervascularity
  - Spectral doppler velocity of the cystic artery which can be seen within wall of anterior gallbladder.
    - Normal velocity <40cm/s
    - If artery cannot be visualized, include color doppler of area and comment in report that it could not be seen.
    - Add code UORGDL if cystic artery is sampled.



## RIGHT KIDNEY:

- Sagittal image of right kidney in medial, middle and lateral views.
- Sagittal measurement of right kidney. Take cine only if abnormality is present.
- Transverse images of superior/mid/inferior right kidney.
- Color Doppler image of any mass or pelviectasis.

## SPLEEN:

- Sagittal and transverse images through spleen
- Sagittal length measurement of spleen
- Sagittal image through left hemidiaphragm and spleen to assess for pleural effusions and ringdown.
- Sagittal image through spleen and left kidney.
- Color Doppler image of any abnormality.

## LOWER QUADRANTS:

- Document RLQ and LLQ (to check for ascites).

## **ADDITIONAL NOTES-**

1. If a patient is coming in for pain, please document within the indication section or the “other” section what the current status of pain is. For instance, how long the patient has had pain, if it’s getting worse or better, and where exactly the pain is. Always take an image where the patient is hurting the most (label as “area of pain”). If this area is located where bowel is, take an image of the area with a linear transducer. When describing the pain, write “per patient, ...” in the indication. Example: Per the patient, his pain is now in the RLQ and getting worse.
2. Cine clip of any abnormality.
3. Say “Not well seen” if structure is not well seen and include the reason why.
4. Any masses, cysts, stones or abnormalities should be measured in three dimensions and have a 2D picture and a color image documented.

## TIPS ABDOMINAL DOPPLER IMAGE LIST

IMAGE	MODE	IMAGE	MODE
Panc Trans H/B/T	2D	TIPS Prox/Mid/Dist <i>without color</i>	2D
Panc Sag H/B/T	2D	TIPS Prox/Mid/Dist <i>w/ color</i>	Color
Splenic Vein at panc	Color	TIPS Prox <i>velocity w angle correction, w color</i>	Spectral cm/s
<i>Panc Duct if dilated</i>	<i>2D +</i>	TIPS Prox <i>velocity w angle correction, no color</i>	Spectral cm/s
		TIPS Mid <i>velocity w angle correction, w color</i>	Spectral cm/s
Left Liver Sag (medial portion)	2D	TIPS Mid <i>velocity w angle correction, no color</i>	Spectral cm/s
Left Liver Sag (lateral portion)	2D	TIPS Dist <i>velocity w angle correction, w color</i>	Spectral cm/s
Left Liver Sag M-L	Cine	TIPS Dist <i>velocity w angle correction, no color</i>	Spectral cm/s
Caudate Liver Sag	2D		
Caudate Liver Trans	2D	GB Sag	
Left Liver Trans (at hepatic vein)	2D	GB Wall w/measurement	2D+
Left Liver Trans (at portal vein)	2D	GB Sag w/ color	Color
Left Liver Trans S-I	Cine	GB Trans	2D
LPV <i>without color</i>	2D	GB Sag LLD	2D
LPV <i>w/ color</i>	Color	GB Trans LLD	2D
LPV <i>velocity w angle correction</i>	Spectral cm/s	<i>GB length if r/o chole</i>	<i>2D+</i>
LHA RI <i>w angle correction</i>	Spectral RI	<i>Cystic duct if r/o chole</i>	<i>Spectral</i>
LHV <i>waveform only unless stent</i>	Spectral		
		CHD w/measurement and color	Color+
Right Liver Trans (at hepatic vein)	2D	CBD w/measurement and color	Color+
Right Liver Trans (at portal vein)	2D		
Right Liver Trans (at hepatic vein)	2D	Right Kidney Sag Mid	2D
Right Liver Trans S-I	Cine	Right Kidney Sag Mid w/ measurement	2D +
Right Liver Sag/Rt Chest	2D	Right Kidney Sag Med	2D
Right Liver Sag	2D	Right Kidney Sag Lat	2D
Right Liver Sag / RK	2D	Right Kidney Trans Sup	2D
Right Liver Sag L-M	Cine	Right Kidney Trans Mid	2D
		Right Kidney Trans Inf	2D
MPV <i>without color</i>	2D		
MPV <i>w/ color</i>	Color	Spleen Sag x2	2D x2
MPV <i>velocity w angle correction</i>	Spectral cm/s	Spleen Sag w/ measurement	2D +
PHA RI <i>w angle correction</i>	Spectral RI	Spleen Trans	2D
RPV <i>without color</i>	2D	Splenic Vein	Spectral cm/s
RPV <i>w/ color</i>	Color		
RPV <i>velocity w angle correction</i>	Spectral cm/s	RLQ/LLQ	2D
RHA RI <i>w angle correction</i>	Spectral RI		
MHV <i>waveform only unless stent</i>	Spectral	<i>For cirrhosis/HCC screening: Capsule</i>	<i>Linear</i>
RHV <i>waveform only unless stent</i>	Spectral		
<i>IVC if indicated</i>	<i>Spectral cm/s</i>	<i>MFI for lesions</i>	<i>MFI</i>

## TIPS ABD DOPPLER ULTRASOUND PROTOCOL HISTORY

	Date	Changes made	By whom
Created	03/03/22	Created separate TIPS protocol	Renee Betit Fitzgerald
Updated	03/03/22	<ul style="list-style-type: none"> <li>-Added history section of report to be used for date, baseline and location of TIPS placement</li> <li>-Added TIPS velocity to be measured, one with and one without color</li> <li>-Added color of SV at pancreas</li> <li>-Added Spectral of SV at hilum</li> <li>-Added angle correction for HAs w length of artery shown</li> <li>-Removed pelvis/bladder area images</li> <li>-Changed NPO requirement to 2-6 hrs</li> </ul>	03/03/22 Protocol Meeting Attendees (Dighe, Lee, Kolokythesis)  (Document updated by Renee Betit Fitz)
Approved	3/14/22		Manjiri Dighe
Added	10/27/22	<ul style="list-style-type: none"> <li>-Cine clips of RHL and LHL in Trv and Sag</li> <li>-Cystic artery and GB length if ruling out cholecystitis</li> </ul>	Renee Betit Fitzgerald
Added	4/15/2024	Image list	Renee Betit Fitzgerald