TIPS US PROTOCOL

PURPOSE:

- To evaluate patency, waveforms and direction of flow in the portal venous system, hepatic arteries and hepatic veins.

INDICATIONS:

- Abnormal liver function tests and/or jaundice.
- TIPS shunt thrombosis/occlusion or stenosis.
- Portal vein thrombosis/occlusion.
- Hepatic vein stenosis/occlusion (Budd-Chiari syndrome).
- Recurrent ascites.

EQUIPMENT:

- 3-5 MHz linear or curved probe

PATIENT PREPARATION & ASSESSMENT:

- The patient should be NPO after midnight or 6-8 hours prior to examination.
- Introduce yourself to the patient.
- Verify patient identity via two patient identifiers (name and date of birth) per hospital policy.
- Explain the examination, its purpose and how long it will take.
- Answer any questions the patient may have regarding the examination.
- Obtain patient history including symptoms, signs, risk factors and other relevant history.

GENERAL GUIDELINES:

- Optimize equipment gain and display settings with respect to depth, dynamic range and focal zones while imaging vessels.
- Add color Doppler to supplement grayscale images with proper color scale to demonstrate areas of high flow and color aliasing.
- Use power Doppler to validate low flow states or occlusions.
- Set spectral Doppler gains to allow a spectral window and optimized to reduce artifacts.
- Cursor sample size will be small and positioned parallel to the vessel wall and/or direction of blood flow.
- A spectral Doppler angle of 45-60 degrees or less will be used to measure velocities. Note exceptions to these angles on the technologist worksheet.
- Send the measurements screenshot page if your machine is capable.
- For focal lesions (masses, cysts, nodules, lymph nodes, fibroids) obtain examination-screen images of the lesion without calibers, with calibers and with Color Doppler.
- Any deviations from the standard protocol and any limitations to the examination should be documented on the technologist worksheet for future reference and for repeatability in follow-up studies.

- Report preliminary critical findings to the referring clinician when appropriate (i.e. immediate medical attention may be warranted) and according to hospital policy.
- For Duplex only exams, use Cerner order US Abdomen Art/Venous Duplex Complete.
- If Grayscale imaging is also ordered, use Cerner order US Abdomen Complete (or Limited) in addition to US Abdomen Art/Venous Duplex Complete.

DOCUMENTATION:

TIPS Shunt

- Document which portal vein to which hepatic vein the shunt connects (usually right portal vein to right hepatic vein).
- Document longitudinal grayscale images, color Doppler images and spectral Doppler images with peak velocity measurements in the proximal, mid and distal portions of the shunt.
- Normal TIPS findings: velocity 90-200 cm/sec throughout the shunt.
- Findings suggesting TIPS malfunction: velocity in PV <30 cm/sec, shunt velocity <90 or >190 cm/sec velocity change >50 cm/sec within shunt, temporal rise/drop in velocity more than 50 cm/sec,
- Hepatofugal or to-and-from flow in PV or continuous (non-phasic) flow in the shunt.

Main Portal Vein

- Document longitudinal grayscale images without and with diameter measurement.
- Document longitudinal color and spectral Doppler images and measure peak velocity. Do not have patient hold his/her breath. It will alter the waveform and velocity and can change the direction of flow entirely.
- Flow should be hepatopedal into the shunt.

Right & Left Portal Veins

- Document longitudinal grayscale and Color and Spectral Doppler images of both veins.
  - Flow should be towards the TIPS.

IVC

- Document longitudinal images of the following:
  - Proximal (at liver / caudate lobe)
  - Mid
  - Distal
- Note any thrombus, occlusion or narrowing.

REFERENCES:

- McNaughton, D. A., & Abu-Yousef, M. M. (2011). Doppler US of the Liver made simple. *RadioGraphics, 31*(1), 161-188. doi:10.1148/rg.311105093.