

# Essential Principles of Liver Doppler Ultrasound: From Basics to Clinical Practice

## Learning Objectives

- Understand the basic principles of Doppler ultrasound
- Optimize Doppler parameters for accurate flow evaluation
- Recognize normal Doppler waveforms of hepatic vessels
- Identify characteristic pathological Doppler findings in clinical settings
- Apply Doppler ultrasound in liver transplantation

## Course Content

### 1. Basic Principles of Doppler Ultrasound

- Doppler effect and frequency shift
- Types of Doppler techniques: color, spectral, and power Doppler
- Importance of angle correction and velocity measurement

### 2. Doppler Parameters and Optimization

- Key parameters: gain, PRF, velocity scale, sample volume, and wall filter
- Common artifacts and practical adjustment strategies

### 3. Normal Hepatic Doppler Findings

- **Hepatic artery:** low-resistance waveform (RI 0.55–0.8)
- **Portal vein:** continuous hepatopetal flow with mild phasic variation
- **Hepatic vein:** triphasic waveform reflecting cardiac cycle

### 4. Pathologic Doppler Findings

- Portal hypertension and cirrhosis: decreased portal vein flow
- Portal vein thrombosis: absent or reduced flow
- Hepatic artery stenosis: tardus-parvus waveform, increased velocity
- Hepatic venous outflow obstruction (Budd Chiari syndrome): monophasic waveform
- Arteriportal shunt and tumor-related flow changes

### 5. Doppler Ultrasound in Liver Transplantation

- Role of Doppler as a primary screening tool for vascular complications
- Anastomosis-focused evaluation
- Hepatic artery complications: thrombosis and stenosis (RI, SAT)
- Portal vein and hepatic vein complications (velocity criteria, waveform changes)

### **Key Clinical Messages**

- Doppler ultrasound is a real-time tool for assessing hepatic hemodynamics in both native and transplanted livers
- Accurate interpretation requires proper optimization of Doppler parameters
- Each hepatic vessel has a characteristic waveform, but variations may occur due to physiologic or technical factors
- Diastolic flow is a key determinant of vascular resistance and should be carefully evaluated
- A tardus-parvus waveform suggests upstream arterial stenosis and requires prompt attention

### **Conclusion**

A clear understanding of Doppler principles and waveform interpretation is essential for accurate diagnosis and early detection of clinically significant vascular abnormalities, particularly in the setting of liver transplantation.