Clinical Audit: Sonographic Assessment of the Hepatic Vasculature

Dr Rawa Burhan (Radiology Registrar), Dr Varanand Htun (Radiology Registrar),
& Dr Alex Fitzhugh (Consultant Radiologist)

Northwick Park Hospital, London North West University NHS Trust

NHS
London North West
University Healthcare
NHS Trust

Introduction

- US liver studies are common among acute inpatients, primarily due to abnormal liver function tests.
- Vascular assessment is important in cases of chronic liver disease and portal hypertension.
- The British Medical Ultrasound Society (BMUS) provides specific recommendations for when vascular assessment is required.

Standard

"**If the liver texture is diffusely abnormal, or if portal hypertension or chronic hepatitis is on the request, Doppler studies of the portal vein and hepatic veins should be obtained.** Normal lower range peak velocity in the main portal vein is 12cm/s in the fasted patient. Higher velocities are not generally of significance except in liver transplants, where it may indicate vessel stenosis and needs reporting if above 40cm/s (mean flow velocity)."

- SoR and BMUS guidelines 2022 (7th Edition)

Aim

- Primary
  - To determine the proportion of patients where the BMUS guidelines are adhered to.
  - Standard: 100% compliance

- Secondary
  - Review of vascular assessment technique.
  - Review of vascular assessment terminology in reports.

Method – Population Selection

n = 445 → n = 148 → **n = 45**

Inpatient Ultrasound studies performed in the Acute Ultrasound Room (Northwick Park hospital) between 1st June 2023 & 30th June 2023.

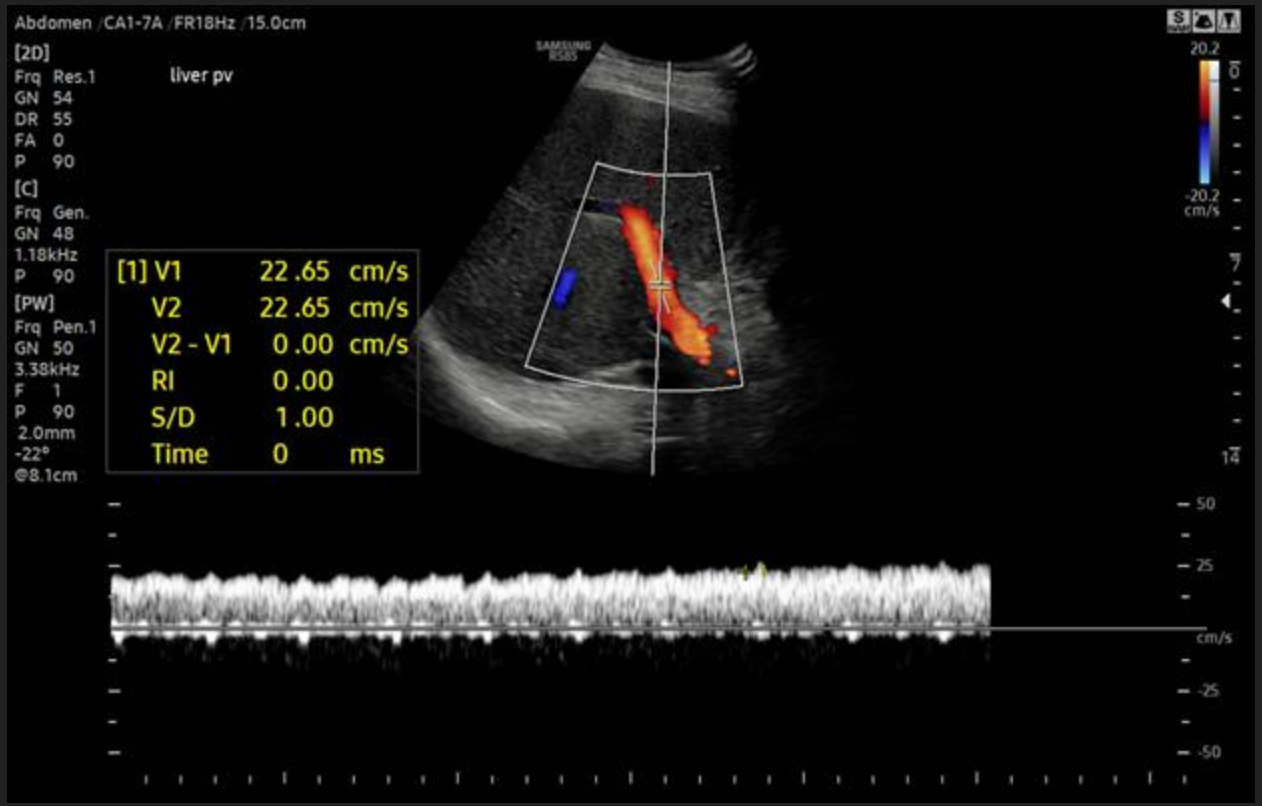
Selection Criteria:

Inclusion:
US Liver, US Liver and Portal Systems, US Abdomen, US Abdomen and Pelvis

Exclusion:
- Paediatric patients (<18yrs)
- Liver transplant patients

Clinical requests, saved images, and reports were assessed for the need for vascular assessment inline with BMUS guidance.

Method – Portal Vein Assessment



Studies were reviewed for colour doppler and spectral trace compliance, and secondarily for appropriateness of technique.

Method – Hepatic Vein Assessment

Studies were reviewed for colour doppler and spectral trace compliance.

Method – Example of Suboptimal Technique

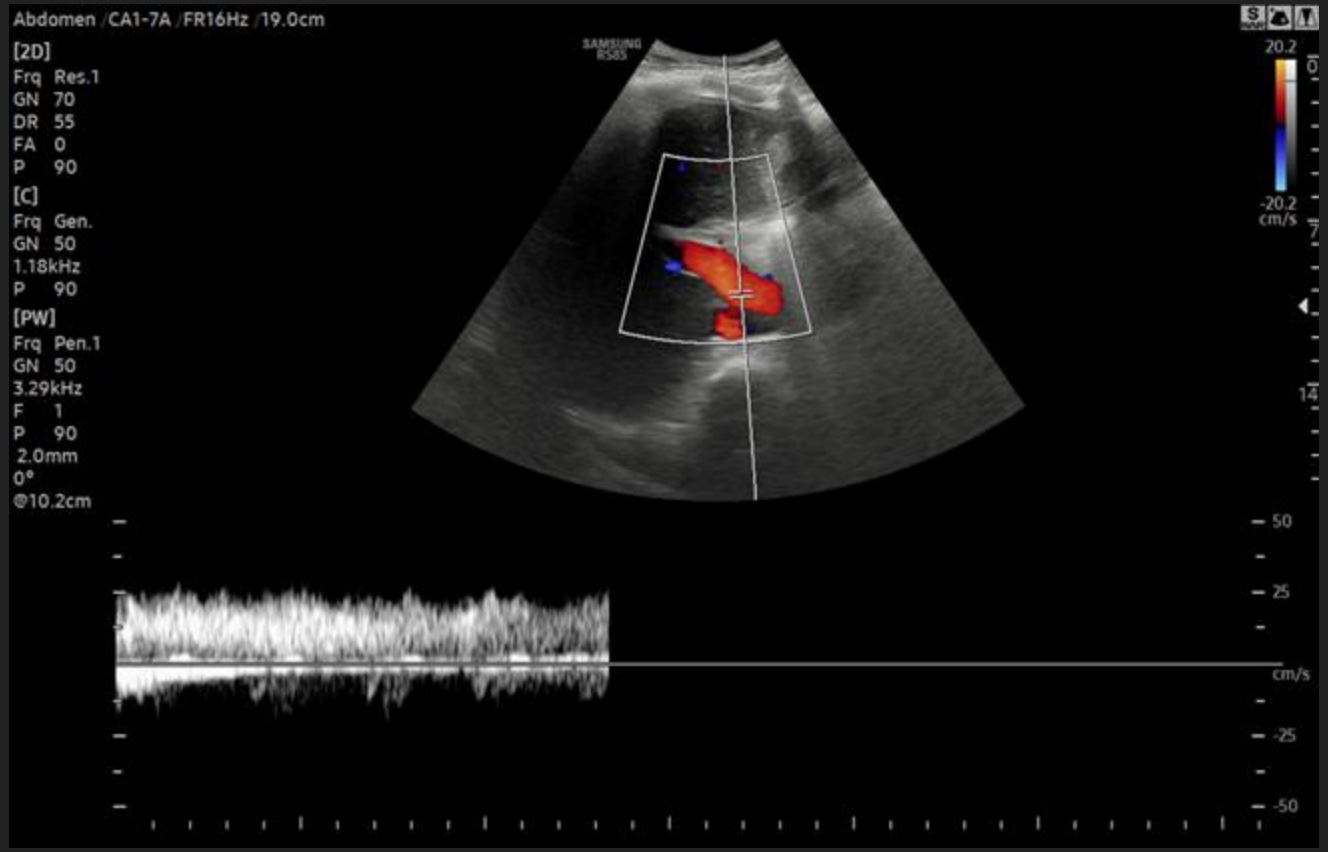
Example of an attempt at sampling PV trace using the subcostal approach.

>Intercostal approach

>Angle correction (if required)

>Proper caliper placement

Method – Example of Suboptimal Technique



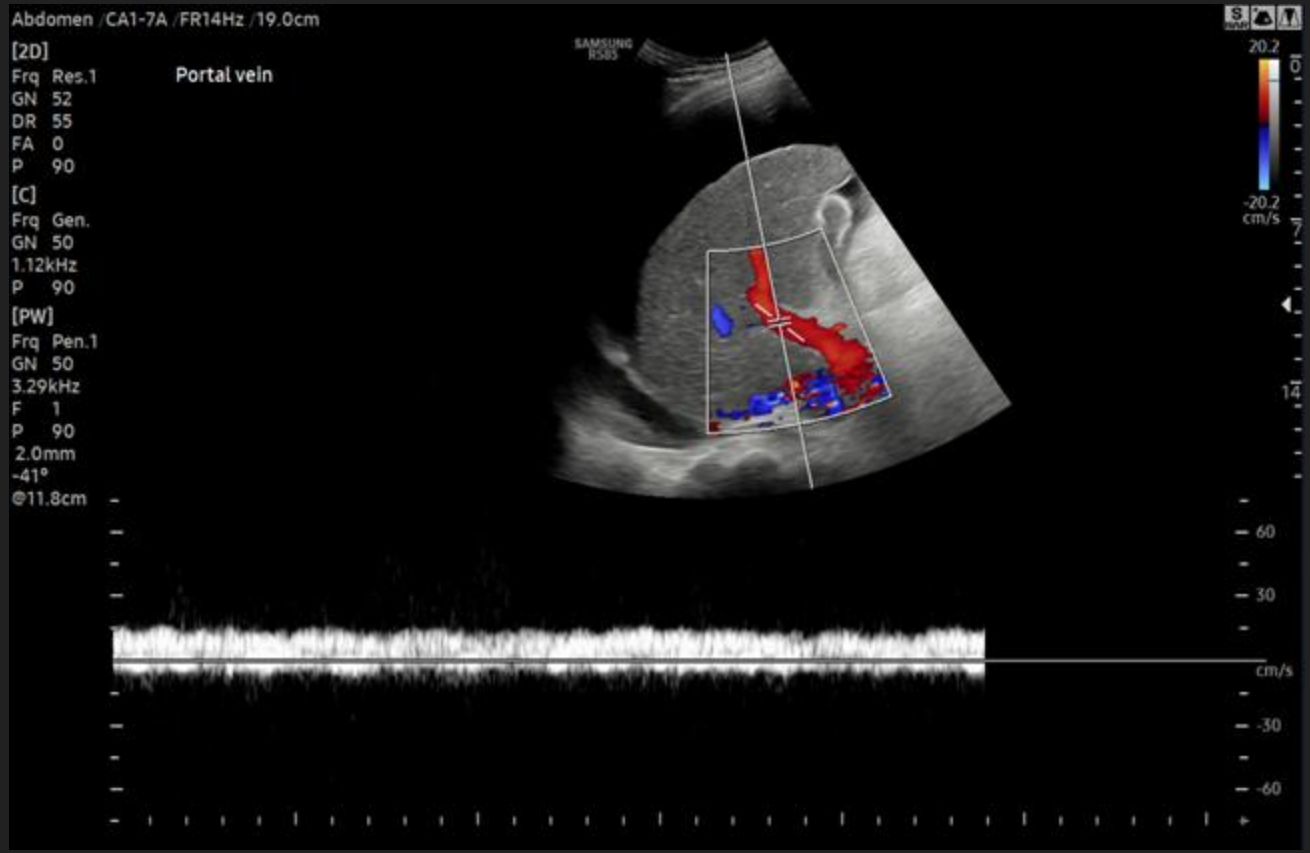
Example where no angle correction was performed.

>Intercostal approach

>Angle correction (if required)

>Proper caliper placement

Method – Example of Suboptimal Technique



Example of lack of caliper placement.

>Intercostal approach

>Angle correction (if required)

>Proper caliper placement

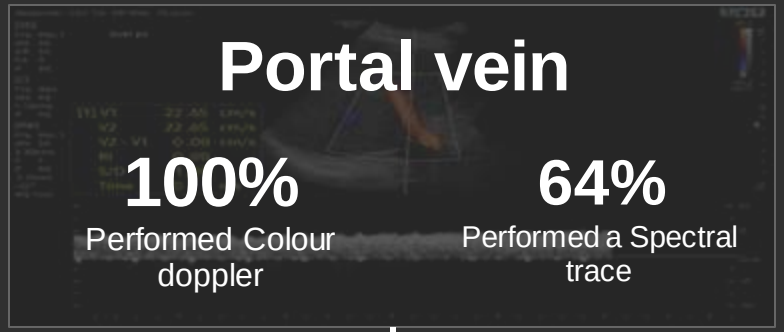
Results - (Demographics)

Male (n= 23, 51%)

Female (n = 22, 49%)

Mean Age (SD) = 79.0 (15.5)

Results – Report Terminology



Portal vein

100%
Performed Colour doppler

64%
Performed a Spectral trace

91%
Mentioned portal vein vascularity within the report

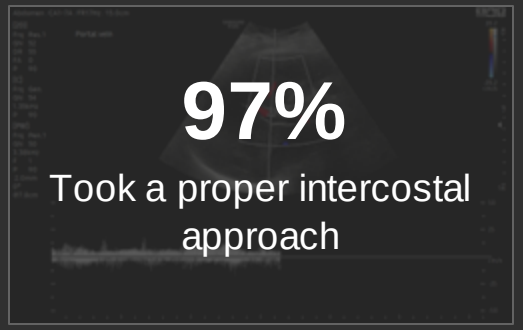
Hepatic vein(s)r

62%
Performed Colour doppler

9%
Performed a Spectral trace

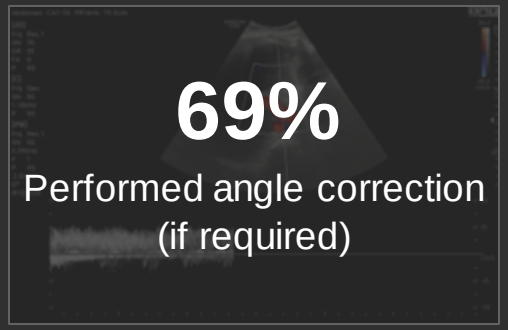
78%
Mentioned hepatic vein vascularity within the report

Results – Portal Vein Technique Review



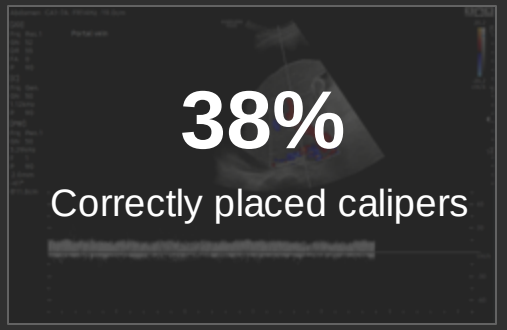
97%

Took a proper intercostal approach



69%

Performed angle correction (if required)



38%

Correctly placed calipers

Discussion – Findings & Recommendations

- Compliance with spectral Doppler assessment was lower compared to colour assessment
- Assessment of the portal vein(s) was more thorough than hepatic vein(s)
- Technique gaps were identified, e.g. lack of angle correction

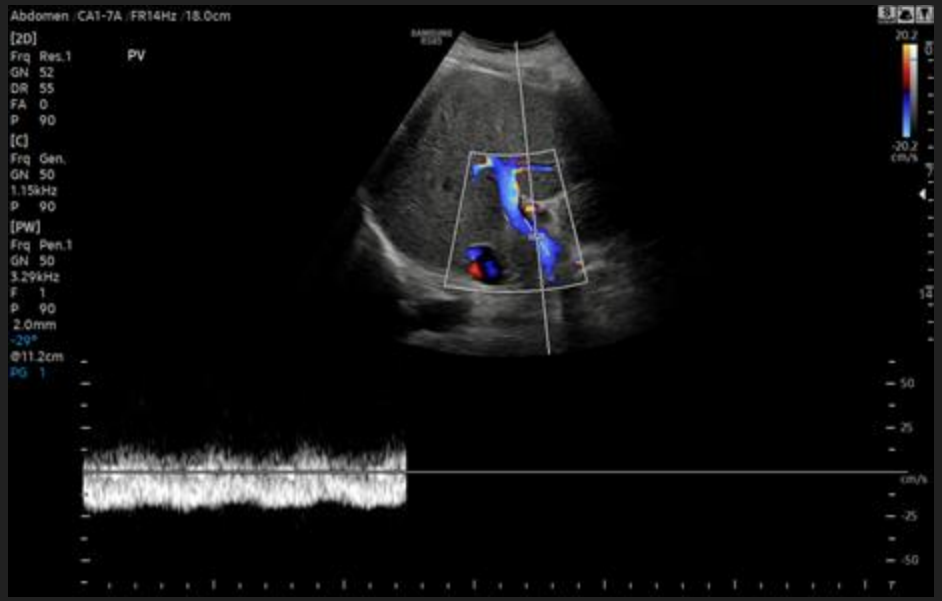
Discussion – Clinical Relevance

- Angle correction and good technique are important for portal vein spectral Doppler. It allows you to obtain the strongest (and therefore reliable) doppler signal, with angle correction ensuring accurate velocities.

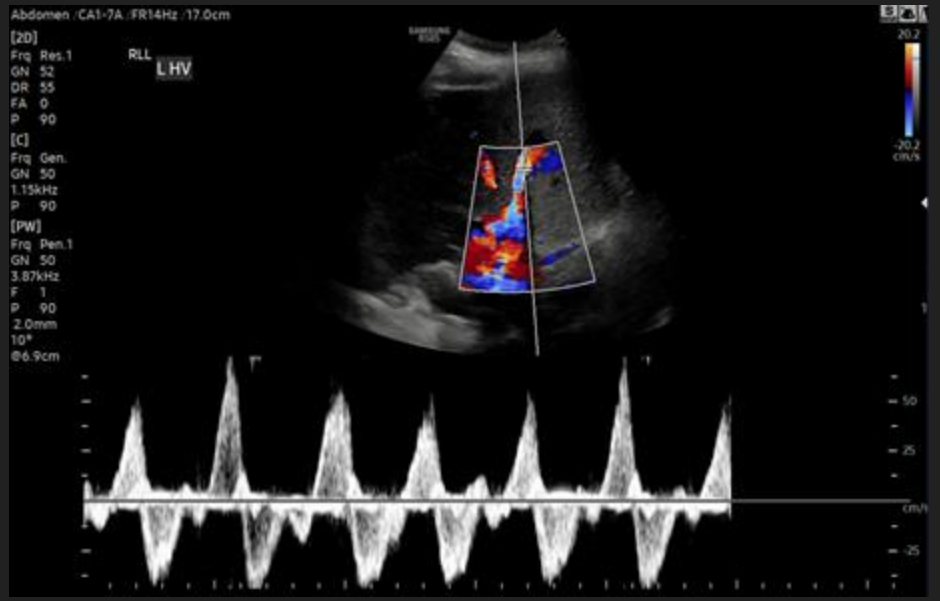
- Accurate velocities are important to non-invasively assess for portal hypertension and measurements such as in TIPS, which affect morbidity / mortality outcomes.

- Spectral Doppler traces of hepatic veins and portal vein allow for more detailed assessment of physiology. For example, together they can provide specific clinical information about the right heart which won't be seen other than on echocardiography and may be the first indication of cardiac failure.

Discussion – Clinical Relevance



Example 1: Hepatofugal (reversed) flow



Example 2: Increased pulsatility with preserved waveform suggesting right sided heart failure

The applications are diverse ...

Discussion – Findings & Recommendations

- Compliance with spectral Doppler assessment was lower compared to colour assessment
- Assessment of the portal vein(s) was more thorough than hepatic vein(s)
- Technique gaps were identified, e.g. angle correction

- Education (Targeted teaching, Technique poster) & Re-audit

Questions

rawa.burhan1@nhs.net / v.htun@nhs.net

References:
- "BMUS Guidelines for Professional Ultrasound Practice" (Seventh Edition, 2022), https://www.bmus.org/media/resources/files/SoR_and_BMUS_guidelines_2022_7th_Ed.docx.pdf
- "Doppler US Of the Liver Made Simple", McNaughten et al., Radiographics, https://doi.org/10.1148/rg.311105093

Affiliations - nil
Declarations of Interest - nil
Potential stakeholders - Radiology registrars & consultants, requesting clinicians, RDAs