Liver care in HIV
Abnormal LFT’s management

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Disclosures

• Consulting fees and honoraria
  – AbbVie, Gilead, Janssen, MSD, ViiV Healthcare

• Grant support
  – Gilead, MSD, ViiV Healthcare
Case 1

- 48 y/o male, prior IDU, HIV 1992,
- CDC C3, on RAL + ABC/3TC
- HBsAg -, HBcAb -, HCV Ab +, HCV RNA -, PPD -
- July 2017: referred from prison due to fever, malaise, anorexia, and weight loss (2 mos.)
  - **PE** = Generalized adenopathy, liver and spleen enlargement,
  - **Labs** = Pancytopenia, BR 0.2 mg/dL, AST 198 U/L, ALT 167 U/L, ALP 372 U/L, GGT 301 U/L, LDH 297 U/L, albumin 3.1 g/dL.
  - **HIV markers** = CD4 157/mm$^3$ (304/mm$^3$ 3 mos. earlier), HIV RNA < 37 copies/mL
  - **CT** = thoracoabdominal adenopathy, multiple small nodules in lung, liver, spleen

What's the more likely diagnosis?
1. Tuberculosis
2. Disseminated MAC
3. Lymphoma
4. Leishmaniasis

Hodgkin Lymphoma (inguinal lymph node biopsy)
Hepatobiliary complaints in patients with HIV

• Viral hepatitis
  – Acute and chronic
• Opportunistic infections
  – MAC, TB, Histoplasma, Candida, Pneumocystis, Bartonella
• Neoplastic infiltrative liver disease
  – AIDS-related and non-AIDS-related
• AIDS cholangiopathy
• Drug-induced liver injury
• NAFLD

Wilcox CM. Evaluation of the HIV-infected patient with hepatobiliary complaints. UpToDate 2018
Diagnostic studies

• Liver blood tests
• Microbiology tests
  – Antibodies, antigen, NAT, stains, cultures, skin testing, etc.
• Imaging
  – US, CT, ERCP
• Liver biopsy

Ab, antibodies; Ag, antigen; NAT, nucleic acid testing; US, ultrasound; CT, computed tomography; ERCP; endoscopic retrograde cholangiopancreatography.

Wilcox CM. Evaluation of the HIV-infected patient with hepatobiliary complaints. UpToDate 2018
Case 2

- 45 y/o HTS African ♂, HIV 2006
- HCV⁻, HBsAg⁻, HBsAb⁺, HAV IgG⁺
- CDC A3 on DRV/r + FTC/TDF
- Occasional cocaine use

- March 2014
  - CD4 316/mm³, HIV RNA < 37 copies/mL
  - ALT 24 U/L, AST 21 U/L
- July 2014 (Admission in other institution)
  - Lacunar stroke, arterial hypertension
  - Discharged on ASA, lisinopril, atorvastatin 80 mg
- September 2014 (asymptomatic)
  - CD4 376/mm³, HIV RNA <37 copies/mL
  - BR 0.4 mg/dL, ALT 637 U/L, AST 286 U/L, ALP 84 U/L, GGT 130 U/L.

What's the more likely diagnosis?
1. Acute hepatitis C
2. Acute hepatitis A
3. Drug induced liver injury (DILI)
4. HBV “flare”

DILI due atorvastatin
Rapid normalization of ALT/AST levels following atorvastatin D/C
Normal US findings, HCV RNA-
## Liver Pathology in Patients with HIV/AIDS

- Groote Schuur Hospital, Cape Town, South Africa
- Study period: 2000 to 2013
- Clinicopathological study in 301 patients

### Table 2. Frequency of Clinicopathological Findings

<table>
<thead>
<tr>
<th>Finding</th>
<th>Frequency, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug-induced liver injuries</td>
<td>127 (42.2)</td>
</tr>
<tr>
<td>Nonspecific hepatitis</td>
<td>51 (40.2)</td>
</tr>
<tr>
<td>Cholestasis</td>
<td>20 (15.7)</td>
</tr>
<tr>
<td>Mixed hepatitis-cholestasis</td>
<td>25 (19.7)</td>
</tr>
<tr>
<td>Submassive necrosis</td>
<td>13 (10.2)</td>
</tr>
<tr>
<td>Ductopenia/vanishing bile duct</td>
<td>11 (8.6)</td>
</tr>
<tr>
<td>Steatohepatitis</td>
<td>5 (4.0)</td>
</tr>
<tr>
<td>Granulomatous (drug-related)</td>
<td>2 (1.6)</td>
</tr>
<tr>
<td>Granulomatous inflammation</td>
<td>86 (29)</td>
</tr>
<tr>
<td>Necrotizing/nonnecrotizing</td>
<td></td>
</tr>
<tr>
<td>Mycobacterium tuberculosis*</td>
<td>61 (71)</td>
</tr>
<tr>
<td>Mycobacterium avium complex†</td>
<td>3 (3.5)</td>
</tr>
<tr>
<td>Cryptococcosis†</td>
<td>1 (1.1)</td>
</tr>
<tr>
<td>Drug</td>
<td>2 (2.3)</td>
</tr>
<tr>
<td>TB-IRIS–related</td>
<td>45 (52.3)</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>56 (19)</td>
</tr>
<tr>
<td>Steatosis/steatohepatitis</td>
<td>58 (19.3)</td>
</tr>
<tr>
<td>Steatosis</td>
<td>42 (72.4)</td>
</tr>
<tr>
<td>Steatohepatitis</td>
<td>16 (27.6)</td>
</tr>
<tr>
<td>Alcoholic liver disease</td>
<td>16 (5.3%)</td>
</tr>
<tr>
<td>Hepatitis C (PCR-positive)</td>
<td>10 (3.3)</td>
</tr>
<tr>
<td>Siderosis &gt; grade 1 (50)</td>
<td>24 (8.0)</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>7 (2.3)</td>
</tr>
<tr>
<td>High-grade B-cell/Hodgkin’s lymphoma</td>
<td>6 (86)/1 (14)</td>
</tr>
<tr>
<td>HIV/AIDS cholangiopathy</td>
<td>7 (2.3)</td>
</tr>
<tr>
<td>Drug-related/adaptive changes</td>
<td>7 (2.3)</td>
</tr>
<tr>
<td>Indeterminate findings</td>
<td>5 (1.6)</td>
</tr>
<tr>
<td>More than one pathological finding</td>
<td>49 (16.2)</td>
</tr>
</tbody>
</table>

# Liver blood tests

| ALT, AST, ALP, bilirubin | • Markers of liver injury, not liver function  
<table>
<thead>
<tr>
<th></th>
<th>• ALT is a more specific marker of hepatic injury than AST</th>
</tr>
</thead>
</table>
| Albumin, bilirubin, prothrombin time | • Markers of hepatocellular function  
|                                       | • Can be influenced by extrahepatic factors |
| Elevated ALP | • Hepatic origin may be confirmed by elevation of GGT or fractionation of ALP |

**ALP**, alkaline phosphatase

What are truly normal liver chemistry tests?

- Normal ALT ranges from 29-33 IU/l for ♂ and 19-25 IU/l for ♀
- A normal ALT level may not exclude significant liver disease
- There is a linear relationship between ALT level and BMI
- AST and ALT ULN ranges can vary between different labs

## Patterns of liver blood tests elevations

<table>
<thead>
<tr>
<th>Patterns of injury</th>
<th>Liver blood test elevations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatocellular</td>
<td>Disproportionate elevation of AST and ALT levels as compared with the ALP level.</td>
</tr>
<tr>
<td>Cholestatic</td>
<td>Disproportionate elevation in ALP level as compared with AST and ALT levels</td>
</tr>
<tr>
<td>Mixed</td>
<td>Elevation of both ALP and AST/ALT levels</td>
</tr>
<tr>
<td>Isolated hyperbilirubinemia</td>
<td>↑ bilirubin &amp; normal ALP/AST/ALT levels</td>
</tr>
</tbody>
</table>

Patterns of liver blood tests elevations

<table>
<thead>
<tr>
<th>Patterns of injury</th>
<th>Liver blood test elevations</th>
<th>R ratio</th>
</tr>
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<tr>
<td>Hepatocellular</td>
<td>Disproportionate elevation of AST and ALT levels as compared with the ALP level.</td>
<td>&gt; 5</td>
</tr>
<tr>
<td>Cholestatic</td>
<td>Disproportionate elevation in ALP level as compared with AST and ALT levels</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>Mixed</td>
<td>Elevation of both ALP and AST/ALT levels</td>
<td>2 - 5</td>
</tr>
</tbody>
</table>

\[
R = \frac{\text{ALT value / ALT ULN}}{\text{ALP value / ALP ULN}}
\]

Isolated hyperbilirubinemia \(\uparrow\) bilirubin & normal ALP/AST/ALT levels

Case 3

- 25 yo MSM, Eastern Europe
- May 2017: HIV + (GP)
- Initial evaluation
  - CD4+ 586/mm3, HIV RNA 5,652 copies/mL
  - ALT 20, AST 17
  - HAV -, HBsAg-, HBcAc-, HCV-, VDRL-
- June 2017
  - Abrupt asthenia and jaundice
  - Hepatomegaly (tenderness)
  - ALT 2,571 U/L, AST 1,005 U/L, BR 6.70 mg/dL, ALP 84 U/L, GGT 130 U/L

What's the more likely diagnosis?

1. Acute hepatitis C
2. Hepatitis A
3. Syphilitic hepatitis
4. Acute hepatitis B

Hepatitis A
(HAV IgM+ / ARN HCV- / HBsAg-)
Cases of hepatitis A by sex, age and week of onset of symptoms. Madrid Province (2016 – 2018)

Spanish National Center for Epidemiology. Weekly report April 17, 2018
Case 4

- 40 y/o HTS African ♂, HIV 2007
- CDC A3
- Chronic HBV (HBeAg+)
- HDV Ab(-), HCV Ab(-), HAV IgG(+)

2015 February (DRV/r + FTC/TDF)
- CD4 499/mm3, HIV RNA < 50 copies/mL.
- ALT 31, AST 32, HBV DNA < 20 IU/mL
- TE 4.9 kPa

2015 November
- 4 mo. without ART (travel to Nigeria)
- Asymptomatic (slight jaundice)
- CD4 370/mm3, HIV RNA 44,900 copies/mL
- BR 4.90 mg/dL, AST 402 U/L, ALT 383 U/L, ALP 159 U/L, GGT 630 U/L

What's the more likely diagnosis?

1. Acute hepatitis C
2. HDV superinfection
3. Syphilitic hepatitis
4. HBV “flare”

**HBV “flare”**

HBV DNA 4.24 x 10^6 IU/mL
(HD Ab- / HCV Ab- / HCV RNA-)
## Causes of elevated AST and ALT

### Hepatic (generally ALT>AST)

- **Chronic viral hepatitis**
- **Acute viral hepatitis**
- **DILI (Prescription and over-the-counter, herbal products, supplements)**
- **NAFLD (Steatosis, NASH)**
- **Toxic hepatitis (amanita exposure)**
- **Hemochromatosis**
- **Autoimmune hepatitis**
- **Wilson’s disease**
- **Alpha-1-antitrypsin deficiency**
- **Celiac disease**
- **Acute bile duct obstruction**
- **Liver trauma**
- **Post-liver surgery**
- **Veno-occlusive disease/sinusoidal obstruction syndrome**
- **Diffuse infiltration of the liver with cancer**
- **HELLP syndrome**
- **Acute fatty liver of pregnancy**
- **Sepsis**
- **Hemophagocytic lymphohistiocytosis**
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<td>• Chronic viral hepatitis</td>
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<tr>
<td>• Acute viral hepatitis</td>
<td>• Cirrhosis (of any etiology)</td>
</tr>
<tr>
<td>• DILI (Prescription and over-the-counter, herbal products, supplements)</td>
<td>• Ischemic hepatitis</td>
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</tr>
<tr>
<td><strong>Non-hepatic (generally AST&gt;ALT)</strong></td>
<td></td>
</tr>
<tr>
<td>• Skeletal muscle damage/rhabdomyolysis</td>
<td></td>
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<tr>
<td>• Cardiac muscle damage</td>
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<tr>
<td>• Thyroid disease</td>
<td></td>
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<tr>
<td>• Macro-AST</td>
<td></td>
</tr>
<tr>
<td>• Strenuous exercise</td>
<td></td>
</tr>
<tr>
<td>• Heat stroke</td>
<td></td>
</tr>
<tr>
<td>• Hemolysis</td>
<td></td>
</tr>
<tr>
<td>• Adrenal insufficiency</td>
<td></td>
</tr>
</tbody>
</table>
### Magnitude of AST and ALT elevations

<table>
<thead>
<tr>
<th>Condition</th>
<th>Magnitude of AST and ALT elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic hepatitis C</td>
<td>Normal to &lt; 2 ULN; rarely &gt; 10 ULN</td>
</tr>
<tr>
<td>Chronic hepatitis B</td>
<td>Normal to 2 ULN; exacerbations &gt; 10 ULN</td>
</tr>
<tr>
<td>NAFLD</td>
<td>&lt; 4 ULN</td>
</tr>
<tr>
<td>ARLD</td>
<td>AST &lt; 8 ULN, ALT &lt; 5 ULN (AST/ALT ≥ 2.1)</td>
</tr>
<tr>
<td>Acute viral hepatitis/DILI with jaundice</td>
<td>&gt; 25 ULN</td>
</tr>
<tr>
<td>Ischemic hepatitis</td>
<td>&gt; 50 ULN</td>
</tr>
</tbody>
</table>

Wilcox CM, UpToDate 2018
Case 5

What's the more likely diagnosis?

1. Acute hepatitis C
2. NAFLD
3. Syphilitic hepatitis
4. Alcoholic hepatitis

42 y/o MSM, HIV 2004
CDC A3
Current ART: DTG/3TC/ABC
HBsAb + and HVA IgG + (vaccinated)
Primary syphilis in 2009
February 2018
- Asymptomatic
- CD4 1,219 cells/mm³, HIV RNA < 37 copies/mL
- ALT 123 U/L, AST 78 U/L (normal values 6 mo. before)
- RPR + 1/64 (negative 6 mo. before)

Acute hepatitis C
HCV Ab+ / HCV RNA+ / Genotype 1a
Chem-sex (IV mephedrone)
Persistently altered liver test (PALT) in HCV patients after SVR with DAAs: a prospective study

• PALT: any increase in ALT, AST or GGT at SVR\textsubscript{12} and SVR\textsubscript{24}.
• 1,112 patients were included
  – 71% ☘️, median age 53 y, 39% cirrhosis, 57% HIV+
• PALT was detected in 130/1,112 patients (12%)
  – HCV-monoinfected 9.4% and HIV-coinfected 13.5%
• Main etiologies
  – NAFLD 36%, alcohol 23% and DILI 15%
• Baseline variables independently associated with PALT
  – Cirrhosis (OR 2.12; 95%CI: 1.28-3.53; P = .004)
  – Liver stiffness (TE) (OR 1.03; 95%CI: 1.01-1.04; P = .000)

Olveira A, et al J Viral Hepat; Epub Date 2018/02/25; DOI 10.1111/jvh.12883
Case 6

• 44 y/o MSM, HIV 2003
• CDC A1 on RPV/FTC/TDF well controlled
• Stable monogamous relationship
• No high alcohol intake
• HBsAb + and HAV + (vaccinated), HCV(-)
• Current problem
  – Progressive gain of weight (BMI 36)
  – Persistently ↑ ALT/AST (75 - 50 U/L)
  – Impaired fasting glucose
  – Hypertriglyceridemia

What's the more likely diagnosis?
1. Drug induced liver injury
2. NAFLD
3. Hemochromatosis
4. Autoimmune hepatitis

NAFLD (NAFL)
US = increased hepatic echogenicity
FIB-4 = 1.3 / NAFLD Score = -2.314
TE = 9.6 kPa
Liver Biopsy: Steatosis > 50% absence of inflammation or fibrosis
Massive elevations of ALT/AST (>10,000 IU/L)

- Ischemic hepatitis
- Drug induced hepatitis
- Rhabdomyolysis
- Heat stroke
Acute liver failure

• Liver tests typically > 10 times the ULN
• Hepatic encephalopathy
• Prolonged prothrombin time
Work-up and management of HIV+ persons with ↑ ALT/AST
Does the person take any potentially hepatotoxic medication/herbal products/illicit drugs? → No

Yes
Stop the drug or replace if feasible; if ARV potentially involved, do not impair efficacy of the regimen

Disappearance of liver abnormalities? → No

Yes

Adapt treatment regimen accordingly
Can you identify recent/chronic alcohol intake?

Yes

Recommend stopping alcohol intake and follow ALT/AST (4-8 weeks may be needed for improvement)

STEP 2

Exclude viral hepatitis test for:
• Hepatitis A (HAV IgM), if status unknown or person non-immune previously → Neg

Manage accordingly
• Acute/chronic HBV (HBsAg) or HCV (HCV-Ab, HCV-RNA), if status unknown or person non-immune/negative previously → Neg

GO TO STEP 3

STEP 3

Identify other causes of increased ALT/AST

Steatosis NASH (metabolic syndrome, diabetes, HCV-associated steatosis)

Nodular regenerative hyperplasia (more frequent in HIV-positive persons)

Other viral diseases (CMV, EBV, Hepatitis E)

Non-hepatic causes of increased ALT/AST
• Coeliac disease
• Myopathy
• Portal hypertension
• Heart failure

Rare disorders
• Autoimmune hepatitis
• Haemochromatosis
• Wilson’s disease
• Alpha-1 antitrypsin deficiency

IN ALL CASES PERFORM:
• Liver ultrasonography
• Liver biopsy

If all causes of increased ALT/AST have been reasonably excluded, consider high HIV-VL as a potential explanation
Work-up and management of HIV+ persons with ↑ ALT/AST

1. Does the person take any potentially hepatotoxic medication/herbal products/illicit drugs?
   - Yes
   - No

   Stop the drug or replace if feasible; if ARV potentially involved, do not impair efficacy of the regimen
   - Yes
   - No

   Disappearance of liver abnormalities?
   - Yes
   - No

   Adapt treatment regimen accordingly
   - Can you identify recent/chronic alcohol intake?
     - Yes
     - No

   Recommend stopping alcohol intake and follow ALT/AST (4-8 weeks may be needed for improvement)
   - Go to Step 2

EACS Guidelines. version 9.0. October 2017
Work-up and management of HIV+ persons with ↑ ALT/AST

Excluding viral hepatitis test for:
- Hepatitis A (HAV IgM), if status unknown or person non-immune previously
  
  **Manage accordingly**

- Acute/chronic HBV (HBsAg) or HCV (HCV-Ab, HCV-RNA), if status unknown or person non-immune/negative previously

  see page 79-85

GO TO STEP 3

EACS Guidelines. version 9.0. October 2017
Work-up and management of HIV+ persons with ↑ ALT/AST

- Identify other causes of increased ALT/AST:
  - Steatosis
    - NASH (metabolic syndrome, diabetes)
    - HCV-associated steatosis
  - Nodular regenerative hyperplasia (more frequent in HIV-positive persons)
  - Other viral diseases
    - CMV, EBV, Hepatitis E

- Identify other causes of increased ALT/AST:
  - Non-hepatic causes of increased ALT/AST
    - Coeliac disease
    - Myopathy
    - Portal hypertension
    - Heart failure
  - Rare disorders
    - Autoimmune hepatitis
    - Haemochromatosis
    - Wilson's disease
    - Alpha-1 antitrypsin deficiency

IN ALL CASES PERFORM:
- Liver ultrasonography
- Liver biopsy

If all causes of increased ALT/AST have been reasonably excluded, consider high HIV-VL as a potential explanation.

EACS Guidelines. version 9.0. October 2017
ACG Practice Guideline: Evaluation of Abnormal Liver Chemistries

Paul Y. Kwo, MD, FACG, FAASLD\textsuperscript{1}, Stanley M. Cohen, MD, FACG, FAASLD\textsuperscript{2} and Joseph K. Lim, MD, FACG, FAASLD\textsuperscript{3}

*Am J Gastroenterol* advance online publication, 20 December 2016; doi:10.1038/ajg.2016.517
Guidelines on the management of abnormal liver blood tests

British Society of Gastroenterology (BSG)


**Clinical Pattern Recognition**

- **Hepatic** liver enzymes ↑ ALT or AST
- **Synthetic failure** Jaundice, low albumin, prolonged INR OR **Suspected malignancy** Weight loss Marked Cholestasis
- **Isolated raised Bilirubin** with otherwise normal liver blood tests
- **Isolated Cholestatic** liver enzymes ↑ ALP & GGT

**History**
- Alcohol history / Metabolic Syndrome & BMI
- Drug history / Risk factors for viral hepatitis
- Personal family history / comorbidities

**ARLD algorithm**

**Liver blood tests including** AST, GGT & FBC + Ultrasound + Liver aetiology screen
- Hepatitis B & C
- Autoantibodies and Immunoglobulins
- Ferritin & Transferrin saturation
- HbA1c

**NAFLD**
- T2DM
- BMI >25
- Dyslipidaemia
- Hypertension

**NAFLD fibrosis algorithm**
- ALT & AST remain abnormal

**Urgent Referral**
- Urgent Ultrasound and/or
- Consider urgent referral to secondary care or admission

**Repeat liver blood tests with split bilirubin and FBC**
- Consider: Reticulocyte and LDH if haemolysis

**Gilbert’s syndrome** confirmed then inform patient and provide information

**Liver blood tests including** GGT + Ultrasound + Liver aetiology screen
- Autoantibodies and Immunoglobulins
- Ferritin & Transferrin saturation

**Abnormal USS appearances and/or positive liver aetiology screen**
- ALP & GGT remain abnormal

**Refer for further specialist management/ investigation as defined by tests**
Evaluation of the HIV-infected patient with hepatobiliary complaints

Author: C Mel Wilcox, MD
Section Editor: John G Bartlett, MD
Deputy Editor: Jennifer Mitty, MD, MPH

All topics are updated as new evidence becomes available and our peer review process is complete. Literature review current through: Mar 2018. | This topic last updated: Mar 08, 2018.
Interpretation of abnormal liver blood tests

• Importance of context
• Clinical pattern
• Extent of abnormality
• Duration of abnormality
## Comprehensive care of patients with chronic liver disease

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-management support</td>
<td>• Disease-specific information</td>
</tr>
<tr>
<td>Harm reduction</td>
<td>• Transmission</td>
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<td>• Weight, exercise, and nutrition</td>
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<td>• Alcohol and tobacco</td>
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<td>• Screening and immunizations</td>
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<td></td>
<td>• Medication management</td>
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<td>• Bone disease</td>
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<td>• Surgical risk</td>
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<tr>
<td>Monitoring</td>
<td>• Progression to cirrhosis</td>
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<td>• Hepatocellular carcinoma (HCC)</td>
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<tr>
<td>Specific management of cirrhosis</td>
<td>• Ascites, varices, encephalopathy, HCC</td>
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<tr>
<td>Liver transplantation</td>
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<tr>
<td>Palliative and end-of-life care</td>
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