Liver Surgery in Cirrhotic Patients

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What should I do????
Learning Objectives

- Understand what is the best treatment option for cirrhotic patients with liver tumors
- Which cirrhotic patients would benefit from a liver resection
- How to assess the resectability of liver lesions in cirrhotic patients
- Who? When? How?
- Best approach to manage cirrhotic patients with liver lesions (Combined HPB and Transplant practice/training)
- How to bring transplant techniques to make cirrhotic patients with liver lesions adequate surgical candidates
Population Argentina = 44 million
Population USA = 327 million
Glaciar Perito Moreno, Patagonia, Argentina

This ice field is the world's third largest reserve of fresh water.
Hornocal, Jujuy. Argentina
14 Colours Hill
Iguazú Falls.
Misiones,
Argentina

Widest falls in the world
Valle de Uco, Mendoza, Argentina
Best Malbec Wine of the world
River Plate Stadium.
Argentina
What should I do????
Liver surgery in a cirrhotic patient
HCC

Patients waiting for a LT

Organ pool
HCC

Liver resection vs. Liver transplantation

Liver transplantation, 5-yr OS 77%

Liver resection, 5-yr OS 36%

P < .0001

Liver transplantation, 5-yr DFS 76%

Liver resection, 5-yr DFS 29%

P < .001
Surgical treatment of HCC

Liver Transplantation

- Best surgical margin
- Curative for cirrhosis
- Avoid de novo tumors
- Cure portal hypertension
- Lower tumor recurrence

Mc Cormack et al. European Journal of Gastroenterology & Hepatology, 2005
HCC

Organ pool

Patients waiting for a LT
Strategies for assessing resectability of liver lesions in cirrhotic patients

Achieving cure

Benefits are higher than the risks for adverse outcome
Preoperative assessment in cirrhotic patients

- Liver Function Reserve
- Severity of Portal Hypertension
- Tumor location/ Future Remnant Liver
- Tumor Stage
Liver surgery in cirrhotic patients

Relevant questions

1. Tumor location?
2. Number of lesions?
3. Type of tumor?
4. Is the liver function normal?
5. Is the liver parenchyma normal?
6. Is portal hypertension confirmed?
7. What’s the degree of portal hypertension?
Liver surgery in cirrhotic patients

Patient work-up

- Abdominal angiogram CT or MRI for precise anatomic location of the lesion, number of lesions, type of lesion, assessment of the portal vein and degree of portal hypertension

- Complete lab work (bilirubin, platelet count, INR, etc)

- Upper GI endoscopy

- Transjugular wedged hepatic venous portography with gradient measurement

- Liver biopsy (percutaneous or transjugular)
Liver function reserve
Preoperative assessment in cirrhotic patients

Liver function reserve

Child Pugh Turcotte Score

- Encephalopathy
- Albumin (mg/dl)
- Bilirubin (mg/dl)
- Ascites
- Prothrombine time
Preoperative assessment in cirrhotic patients

Is the liver parenchyma normal?
Preoperative assessment in cirrhotic patients

Is the liver parenchyma normal?
Preoperative assessment in cirrhotic patients

Is the liver parenchyma normal?
Is the portal hypertension confirmed?

Is there ascites?

Is the spleen big?

Are there any varices or collateral circulation?

What’s the platelet count?
Preoperative assessment in cirrhotic patients

Is the portal hypertension confirmed?

Chronic inflammation

- Hepatic fibrosis
- Splenomegaly
- Increase of portal venous pressure
- Development of collateral vessels
- Variceal bleeding
- Hepatic encephalopathy
- Ascites
Preoperative assessment in cirrhotic patients

Is the portal hypertension confirmed?

- Recurrent variceal bleeding
- Spontaneous bacterial peritonitis
- Refractory ascites
- Invalidant encephalopathy
Preoperative assessment in cirrhotic patients

Is the portal hypertension confirmed?

- Recurrent variceal bleeding
- Spontaneous bacterial peritonitis
- Refractory ascites
- Invalidant encephalopathy

- NO ascites
- NO collateral vessels
-Platelets >100
Preoperative assessment in cirrhotic patients

Is the portal hypertension confirmed?

- Recurrent variceal bleeding
- Spontaneous bacterial peritonitis
- Refractory ascites
- Invalidant encephalopathy

**NO ascites**
**NO collateral vessels**
Platelets > 100,000

**NO ascites**
**NO collateral vessels**
Platelets ~ 80,000
Preoperative assessment in cirrhotic patients

What’s the degree of portal hypertension?

**HVPG**
Hepatic venous pressure gradient

- WHVP: Wedged Hepatic Venous Pressure
- FHVP: Free Hepatic Venous Pressure

A. Free HV pressure
B. Wedged HV pressure

Catheter
HV
IVC
Sinusoids
PV
Preoperative assessment in cirrhotic patients

What’s the degree of portal hypertension?

**HVPG**
Hepatic venous pressure gradient

- **WHVP**  
  Wedged Hepatic Venous Pressure

- **FHVP**  
  Free Hepatic Venous Pressure

- **≤5 mmHg**: Normal
- **6 and 9 mmHg**: Subclinical portal hypertension
- **≥10 mmHg**: Clinically significant.
- **≥12 mmHg**: Risk for variceal bleeding
Preoperative assessment in cirrhotic patients

Severity of Portal Hypertension

Surgical Resection of Hepatocellular Carcinoma in Cirrhotic Patients: Prognostic Value of Preoperative Portal Pressure

JORDI BRUIX,* ANTONI CASTELLS,* JAUME BOSCH,* FAUST FEU,* JOSEP FUSTER,† JOAN CARLES GARCIA–PAGAN,* JOSEP VISA,‡ CONCEPCIÓ BRU,§ and JOAN RODÉS* *Liver Unit and Departments of *Surgery and §Radiology, Hospital Clinic i Provincial, University of Barcelona, Barcelona, Spain

Ascites
Trombocitopenia
Esophageal varices
Portal colateral circulation
Survival following liver resection in HCC

Portal pressure in patients suffering postoperative liver failure was higher than on those patients that did not decompensated post resection (13.9±2.4 vs 7.4±3.5mmHg, p<0.001).

No patient with a GPVH <10mmHg suffered decompensation following liver resection.

Preoperative assessment in cirrhotic patients

Severity of Portal Hypertension

Early HCC - Child Pugh A

No portal hypertension

Portal hypertension (HVGP > 10 mmHg)

Clinical Risk for Liver Transplant

RESECTION

TRANSPLANTATION

ABLATION

Bruix et al. Gastroenterology 1996
Survival following liver resection in HCC

What’s the degree of portal hypertension?

- **HVPG**
  - Hepatic venous pressure gradient

- **WHVP**
  - Wedged Hepatic Venous Pressure

- **FHVP**
  - Free Hepatic Venous Pressure

<12 mmHg
Preoperative assessment in cirrhotic patients

Tumor location
Preoperative assessment in cirrhotic patients

Tumor location and Type

Magnitude of liver resection  Future remnant liver volume
Preoperative assessment in cirrhotic patients

Tumor location: **Favourable tumor**
Preoperative assessment in cirrhotic patients

Tumor location: **Favourable tumor**
Tumor location: **Favourable tumor**
Preoperative assessment in cirrhotic patients

**Indications for safe liver resection**

- Enough Liver Function
- Mild Portal Hypertension
- Adequate Future Remnant Liver (>40%)
- Tumor amenable for complete clearance
Preoperative assessment in cirrhotic patients

Liver volume assessment
Preoperative assessment in cirrhotic patients

**Liver volume assessment**

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Patient-996  
F, 20190808

Liver: 1286.3 ml  
Cut Liver: 828.8 ml / %64.4  
FLR: 459.9 ml / %34.2  
Cut Plane: 17.7 ml / %1.4

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Patient-996  
F, 20190808

Liver: 1286.3 ml  
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FLR: 459.9 ml / %34.2  
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Surgical treatment of HCC

Liver Transplantation

Burden on the waiting list
Organ shortage
Long waiting time
Drop-out risk
Deceased donor marginal grafts

Higher cost
Rejection
Long-term immunosuppression

Mc Cormack et al. European Journal of Gastroenterology & Hepatology, 2005
### Indications for liver resection

**Questionable indications of liver resection**
(QUESTIONABLE benefit compared to non-surgical therapy)

<table>
<thead>
<tr>
<th>Large tumor</th>
<th>Bilobar or multinodular</th>
<th>Major vascular invasion (MPV/IVC)</th>
<th>Recurrent HCC</th>
</tr>
</thead>
</table>

Mc Cormack et al. European Journal of Gastroenterology & Hepatology, 2005
Can we successfully Down-stage patients with Macrovascular Invasion?
Neoadjuvant Three-Dimensional Conformal Radiotherapy for Resectable Hepatocellular Carcinoma With Portal Vein Tumor Thrombus: A Randomized, Open-Label, Multicenter Controlled Study

A

B

Time Since Random Assignment (months)

No. at risk
Neoadjuvant RT 82 73 57 30 14
Surgery alone 82 66 29 10 4

No. at risk
Neoadjuvant RT 82 46 24 12 7
Surgery alone 82 33 9 3 2

OS (probability) 0.2 0.4 0.6 0.8 1.0

DFS (probability) 0.2 0.4 0.6 0.8 1.0

$P < .001$
Unquestionable contraindications for liver resection

- Not enough function (Child Pugh C)
- Severe Portal Hypertension
- Small Future Remnant Liver
- Tumor not amenable to complete clearance
Surgical treatment of HCC

¿Who should be resected? Who should be transplanted?
LDLT

Living donor liver

Right lobe graft  Left lobe graft  Left lateral lobe graft
Intention to treat analysis

LDLT showed an increase in survival from the time of listing.
Survival advantage of LD available for patients with HCC HR 0.75 (0.59-0.96), p=0.02

Live donor liver transplantation for patients with hepatocellular carcinoma offers increased survival vs. deceased donation

Adjusted HR = 0.66 (95% CI 0.45-0.96), p = 0.02

Log-rank test p = 0.02

<table>
<thead>
<tr>
<th>Months after listing</th>
<th>pDDLT</th>
<th>pLDLT</th>
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<tbody>
<tr>
<td>0</td>
<td>632</td>
<td>219</td>
</tr>
<tr>
<td>3</td>
<td>474</td>
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<td>6</td>
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<td>49</td>
</tr>
<tr>
<td>12</td>
<td>148</td>
<td>33</td>
</tr>
</tbody>
</table>

Transplant survival according to graft type?

LDLT 65% vs DDLT 71% within Milan
LDLT 26% vs DDLT 18% beyond UCSF

¿Who should be resected? Who should be transplanted?
¿Who should be resected? Who should be transplanted?
Hilar and Intrahepatic Cholangiocarcinoma

Treatment of choice is RESECTION

FIG. 1. CCA locations. (A) Intrahepatic (iCCA). (B) Hilar (hCCA). (C) Distal.

Goldaracena N et al. Liver Transpl 2018
Hilar and Intrahepatic Cholangiocarcinoma

Treatment of choice is RESECTION

Cirrhosis complicates things in cholangiocarcinoma

FIG. 1. CCA locations. (A) Intrahepatic (iCCA). (B) Hilar (hCCA). (C) Distal.

Goldaracena N et al. Liver Transpl 2018
Hilar Cholangiocarcinoma - Cirrhosis

Treatment of choice is RESECTION

Goldaracena N et al. Liver Transpl 2018
Intrahepatic Cholangiocarcinoma - Cirrhosis

Treatment of choice is RESECTION

FIG. 1. CCA locations. (A) Intrahepatic (iCCA). (B) Hilar (hCCA). (C) Distal.

Goldaracena N et al. Liver Transpl 2018
Liver Transplantation for iCCA

iCCA in Cirrhotics

Large/Multifocal iCCA
Liver Transplantation for iCCA

- LT is contraindicated in most centers due to poor results
- Studies are based on single center analysis with small number of patients
- Studies analyze patients with both iCCA and hilar cholangiocarcinoma
- Studies analyze patients with and without liver cirrhosis
Bringing transplantation techniques into surgical oncology

Salina Grande, Jujuy, Argentina
Associated Liver Partition and Portal vein ligation for Staged hepatectomy (ALPPS)
A Novel Concept for Partial Liver Transplantation in Nonresectable Colorectal Liver Metastases

The RAPID Concept

Pål-Dag Line, MD, PhD,* Morten Hagness, MD, PhD,* Audun Elnaes Berstad, MD, PhD,† Aksel Foss, MD, PhD,*§ and Svein Dueland, MD, PhD†

Auxiliary Transplant and Liver Resection

Fig. 3 Step 1: Auxiliary transplantation of the left lateral lobe of the donor

Annals of Surgery • Volume 262, Number 1, July 2015
The Rapid Concept
Paradigm Shift in the Management of Irresectable Colorectal Liver Metastases

Living Donor Auxiliary Partial Orthotopic Liver Transplantation in Combination With Two-stage Hepatectomy (LD-RAPID)

Alfred Königsrainer, MD,* Silke Templin, MD,* Ivan Capobianco, MD,* Ingmar Königsrainer, MD,* Michael Bütter, MD,† Lars Zender, MD,‡ Bence Sipos, MD,§ Lothar Kanz, MD,‖ Silvia Wagner,* and Silvio Nudalín, MD, FEBS*
LETTER TO THE EDITORS

Auxiliary liver transplantation with a small deceased liver graft for cirrhotic liver complicated by hepatocellular carcinoma

58 y old with single iHCC lesion compromising the RHV and no remnant liver volume

**Approach**

- Liver exclusion
- V – V bypass
- Resection of lesion and RHV
- *Reconstruction of RHV as in LDLT*
Liver Surgery in Cirrhotic Patients

Summary / Conclusions

• Liver resection in cirrhosis is a great treatment option under the right circumstances

• HCC – Liver transplantation is the best treatment option

• Proper preoperative assessment to reduce the risk of postoperative decompensation

• Multidisciplinary approach

• Treatment provided by surgeons with combined training/experience in hepatobiliary surgical oncology and transplantation