

# Reducing the waiting list: Auxiliary Liver Transplantation using left lateral segments

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# Auxiliary liver transplantation

## Clinical indications over 60 years

Chronic liver disease – historical?

Acute liver failure – most common indication

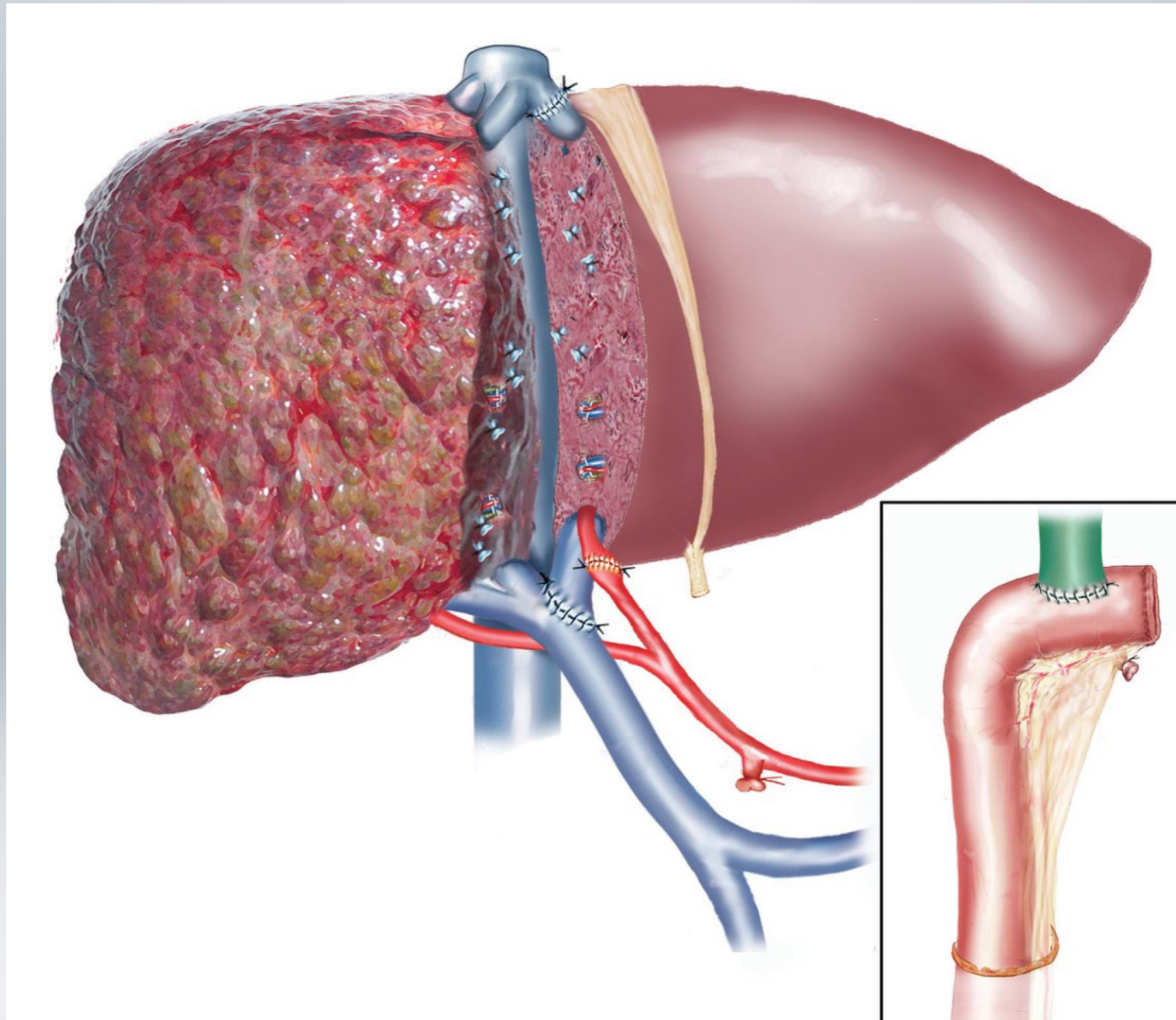
Inborn errors of metabolism based in the liver

Small for size liver

Liver-kidney transplantation in presensitized patients

Supplementing organ shortage?

Fig. 1



# Auxiliary liver transplantation for chronic liver disease

Cirrhotic liver



Long term risk of HCC



Orthotopic liver transplantation

# Auxiliary liver transplantation for acute liver failure

## Current status

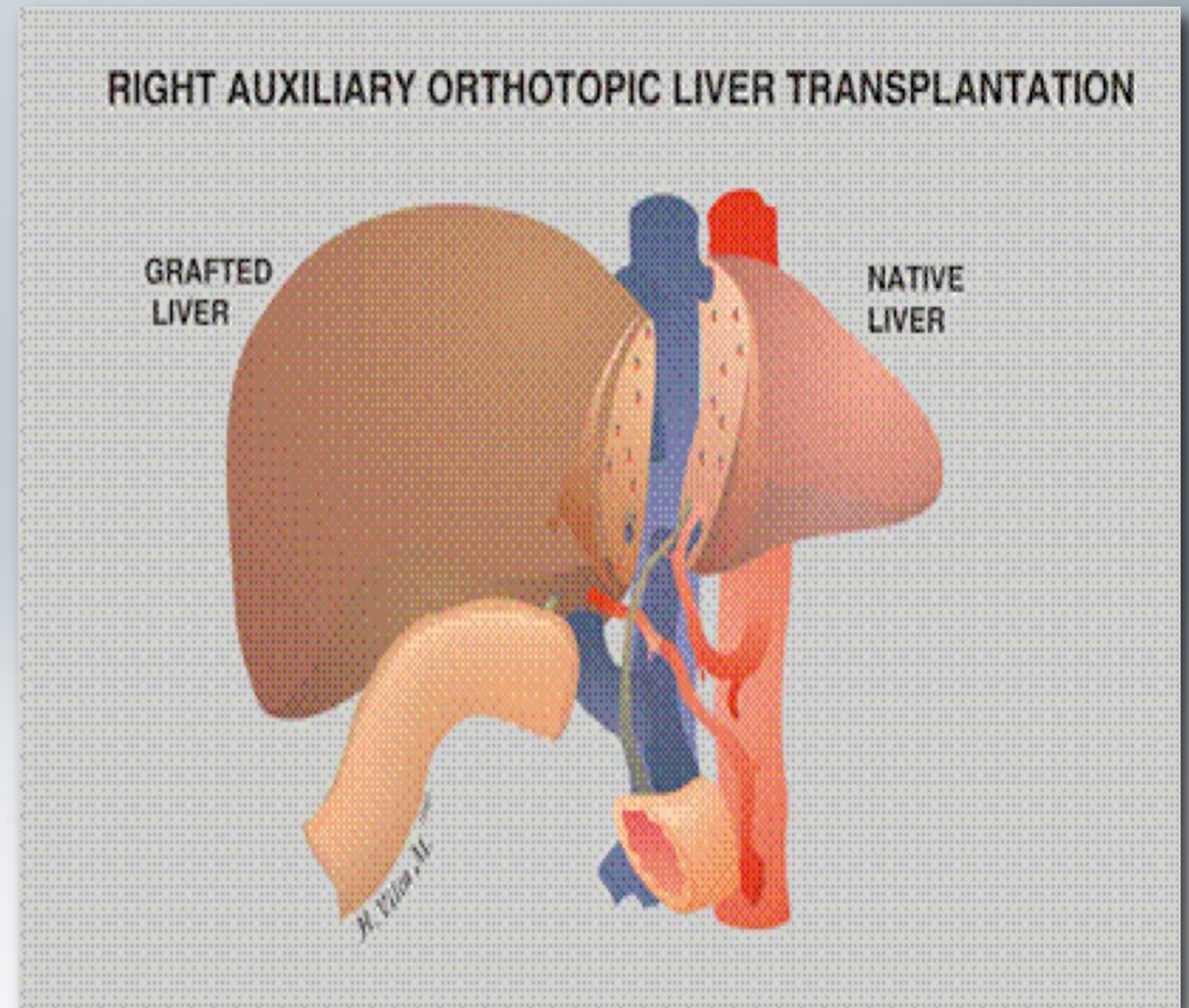
Acute liver failure

Strict selection criteria

Conventional IS

Comparable survival

> 70% weaned off IS



# Auxiliary liver transplantation for acute liver failure

## Technical considerations

Orthotopic vs heterotopic

Difficulty of hepatectomy – porto-caval shunt

Piggyback or cavo-cavoplasty venous outflow

End-to-side porto-portal anastomosis

Arterial inflow – donor iliac conduit or native right or left hepatic artery

Short retrocolic Roux-en-Y hepatico-jejunostomy or duct-to-duct

# Auxiliary liver transplantation for metabolic disease

## Reported cases

Crigler-Najjar type 1

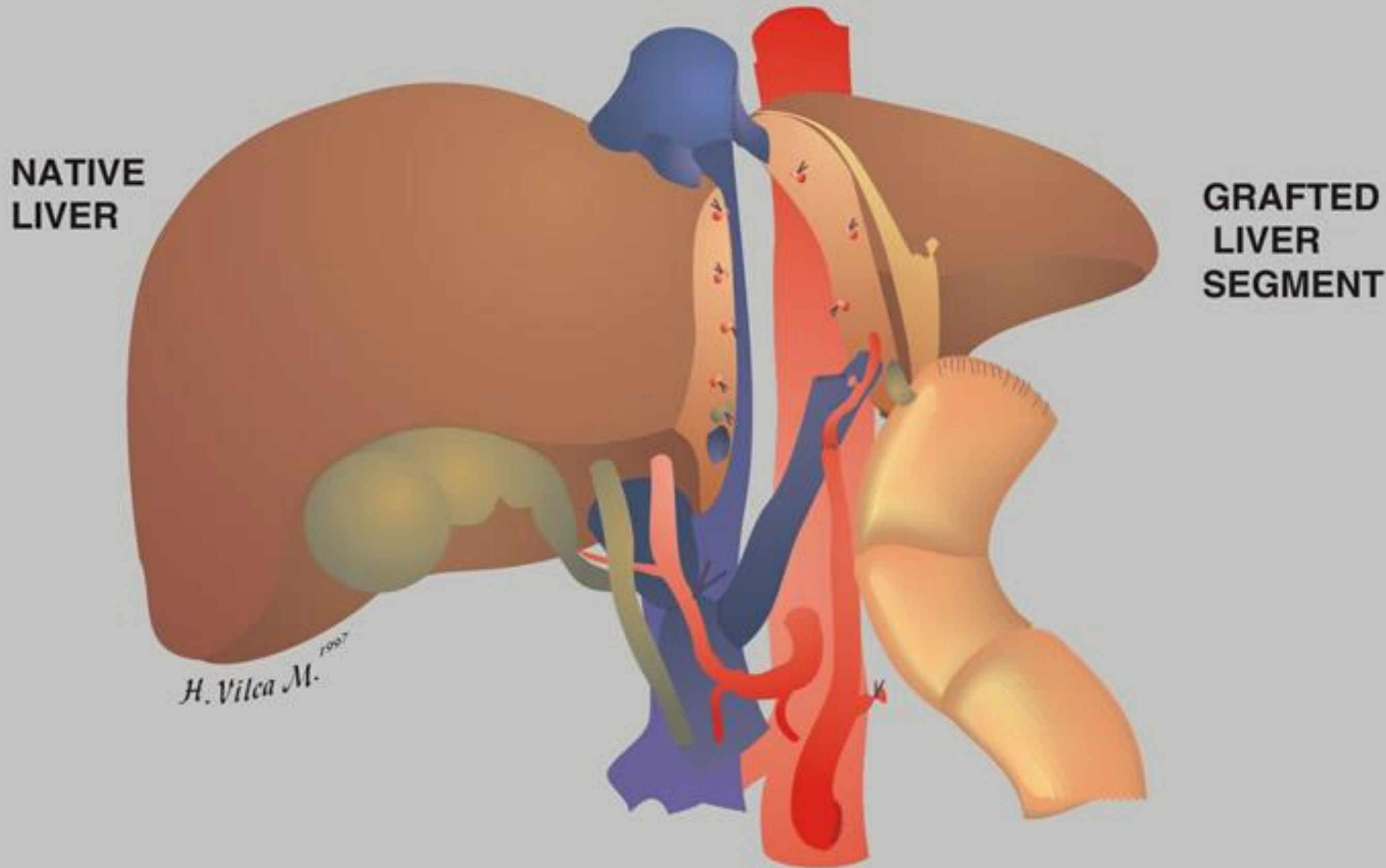
OTC deficiency

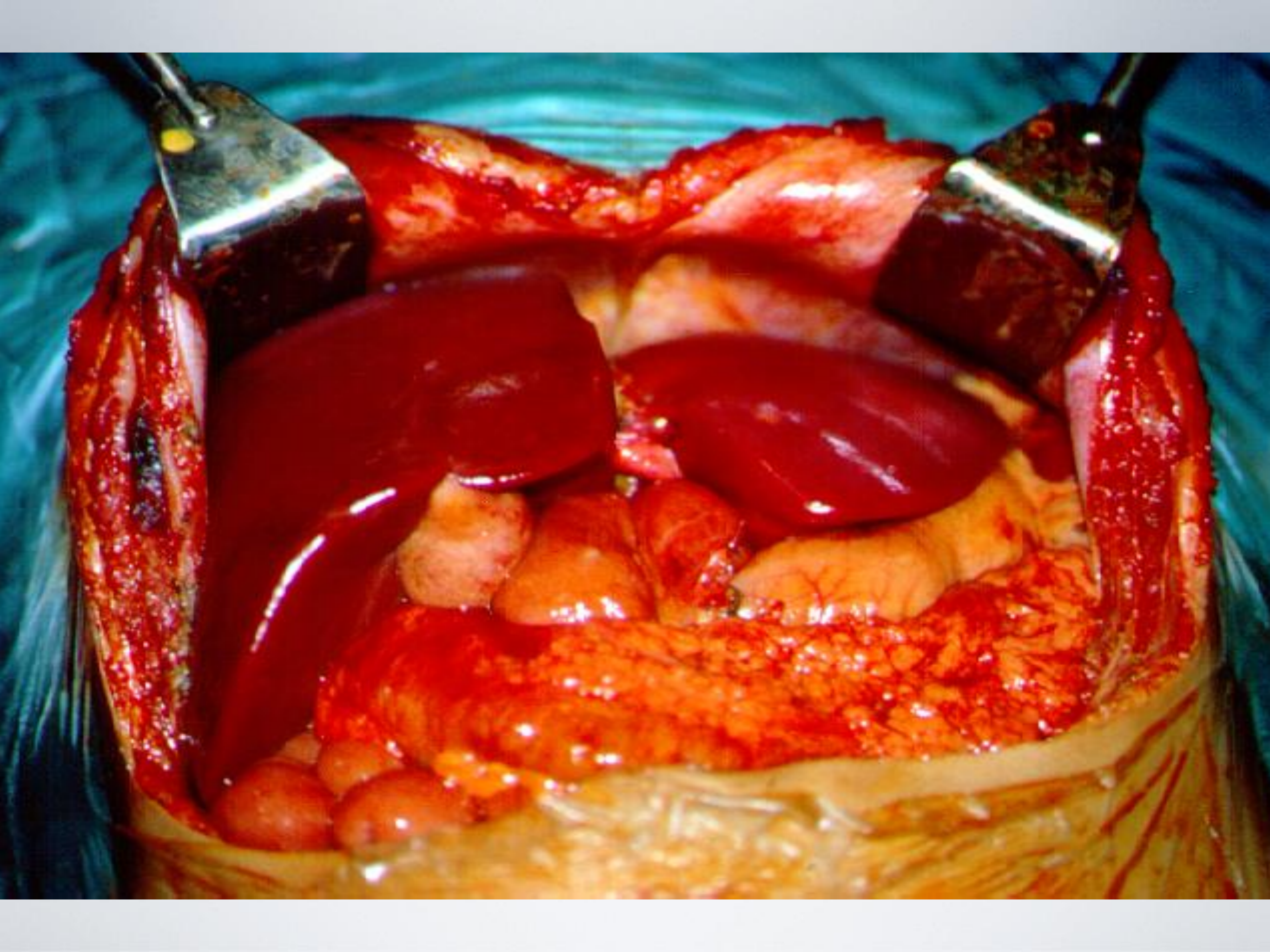
Hypercholesterolaemia

Citrullinaemia

Propionic acidemia

# AUXILIARY ORTHOTOPIC LIVER TRANSPLANTATION





# Auxiliary liver transplantation for metabolic disease (noncirrhotic)

Left hepatectomy (S1-4) to give caval access

Portal venous inflow - banding/occlusion of RPV

Graft size dictated by metabolic correction (small for size graft)

Assessing graft function – interpreting liver function tests

Late graft atrophy – technical problem or non-adherence

Difficult to perform late native liver resection (portal vein)

# Auxiliary liver transplantation – Kyoto experience

## 31 APOLT (all living donor)

Acute liver failure – 6

Noncirrhotic inborn errors of metabolism – 6

Small for size grafts – 13

ABO incompatible – 6

Survival at one and 5 years 58% and 51%

(vs 79% and 74% for standard living donor)

Higher incidence of acute rejection 58% vs 35%

More biliary complications and retransplantation

# Auxiliary liver transplantation – Kyoto experience

## Acute liver failure – 6

All died – sepsis and graft failure

Significant technical complications and 2 retransplants

No withdrawal from immunosuppression

## Noncirrhotic inborn errors of metabolism– 6

OTC, Citrullinaemia, Crigler-Najjar type 1

Portal banding/diversion

Graft and patient survival at 5 years 83% and 83%

(vs 71% and 63% for whole liver replacement)

# Auxiliary liver transplantation for other indications

Small for size ( $< 0.62$  GRWR) – 13

**1 year and 5 year patient survival of 69% and 69%**

Significant technical complications and 2 retransplants

(vs 65% and 65% for liver replacement)

ABO incompatible – 6

Graft survival at 1 and 5 years 67% and 47%

Patient survival at 5 years 67% and 67%

(vs 53% and 43% for liver replacement)

Kasahara et al, Am J Transpl 2005

# Auxiliary liver transplantation

## Potential impact on waiting list

Growing livers in situ – either **split or living donor**

cirrhotic – HCC or chronic liver disease

noncirrhotic – colo-rectal cancer or noncirrhotic metabolic disease

Acute liver failure – and split right or left livers

‘Mix and match’ – noncirrhotic inborn errors of metabolism

# A novel concept for partial liver transplantation in nonresectable colorectal liver metastases: The **RAPID** Concept

50y old wt 93kg with CRLM

Left hepatectomy and RPV ligation (margin clear of tumour)

Left lateral segment graft (330g) and 2-stage hepatectomy

Doubling of liver graft size by 2 weeks

No small for size postoperatively

Extended right hepatectomy on day 23

# 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)

Potential for transplantation of unresectable colorectal liver metastases

Scarcity of organs

Lack of splittable grafts?

Potential of using living donors

# **Living donor liver transplant with two stage hepatectomy for unresectable colo-rectal liver secondaries – LIVER-T (W) O-HEAL**

49y old with CRLM

Left hepatectomy and RPV ligation

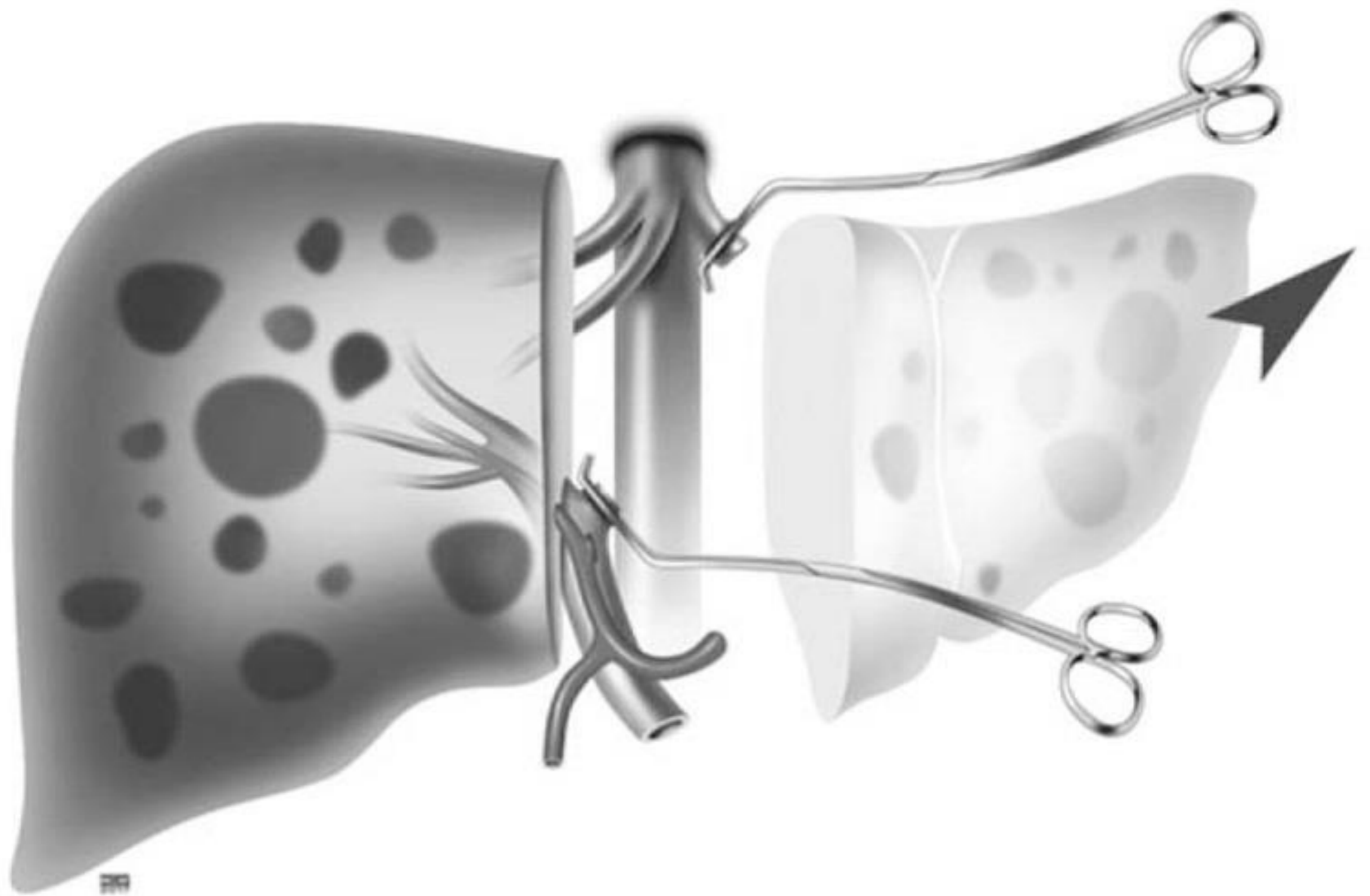
Left lateral segment graft and 2-stage hepatectomy

Small for size but with recovery

5 months micrometastases in bone marrow and lung

Some disease progression at 2 years

RauchfulB et al. World J Oncol 2019; 17: 1549-5



CURRENT OPINION IN ORGAN TRANSPLANTATION

A new approach for **increasing availability of liver grafts** and **donor safety in living donor liver transplantation**  
LD-RAPID procedure in the cirrhotic setting with **hepatocellular carcinoma**

First reported case - Use of left lateral segment graft and 2-stage hepatectomy

Using living donor in patient with portal hypertension, cirrhosis and HCC

3cm segment 8 HCC on background of NASH (MELD 8)

Donor not suitable for right lobe donation

Hemi-portocaval shunt to manipulate portal pressure

Second stage at 35 days with splenic artery ligation

# A systematic review of auxiliary liver transplantation of small-for-size grafts in patients with chronic liver disease

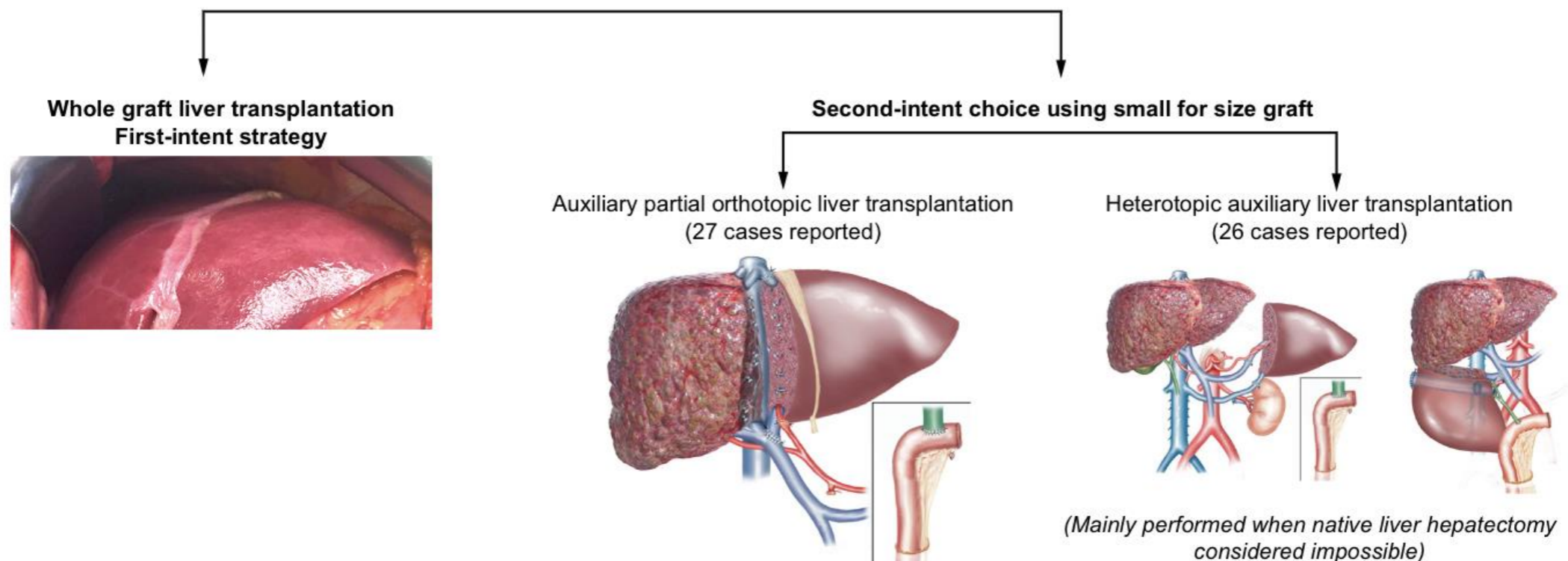


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JHEP Reports 2022. <https://doi.org/10.1016/j.jhepr.2022.100447>

## Chronic liver disease (low MELD score) + HCC requiring liver transplantation Context of organs shortage



### Major points needing specific consideration:

- Perioperative over risk counterbalanced by improved access to graft (lower drop-out risk)
- Graft from living or deceased donor
- Portal modulation must be individually tailored (consider flow and pressure)
- Removal of native liver recommended to prevent HCC occurrence (9/27 cases after APOLT)



# Auxiliary liver transplantation to improve organ utilisation

Using left lateral or left liver grafts as auxiliary and grow

Splittable livers currently 10% of cadaveric donor pool

For **cadaveric** – need to define the recipient suitable for right lobe graft

For **living donors** – increase numbers less age and liver size restrictions

Particularly suitable for stable low MELD patients?

# Auxiliary liver transplantation potential recipients

Hepatocellular carcinoma (use of neoadjuvant therapies)

Inoperable colorectal liver cancer

Metabolic diseases particularly noncirrhotic)

Low MELD chronic liver disease

Relative contra-indications

Budd-Chiari syndrome

Severe portal hypertension?

Hepatopulmonary syndrome

# Auxiliary liver transplantation: technique

Orthotopic position

For LLS perform left hepatectomy for HV and caval access

Non-cirrhotic (banding of RPV to ensure flow to graft)

Cirrhotic (pressure measurements and intervention – shunt etc)

Use LHA and LBD if possible (good size match)

Optimal time for native hepatectomy ? 3-4 weeks or longer (PVE)