

An approach to the technically challenging paediatric liver transplant

Jean de Ville de Goyet

An approach to the technically challenging
paediatric liver transplant

**Technical tips on
« getting out of trouble in theatre »**

Technical tips on « getting out of trouble in theatre »

- the congested living donor graft with suspected poor venous outflow**
- the poor portal inflow situation**
- the arterial inflow problem / jump graft size discrepancy with the graft artery**
- the approach to massive bleeding during explants,**
- a view on porto-caval shunts or venous bypass at transplant**

**Technical tips on
« getting out of trouble in theatre »**

First Rule:

Anticipate

and prevent trouble.

**Technical tips on
« getting out of trouble in theatre »**

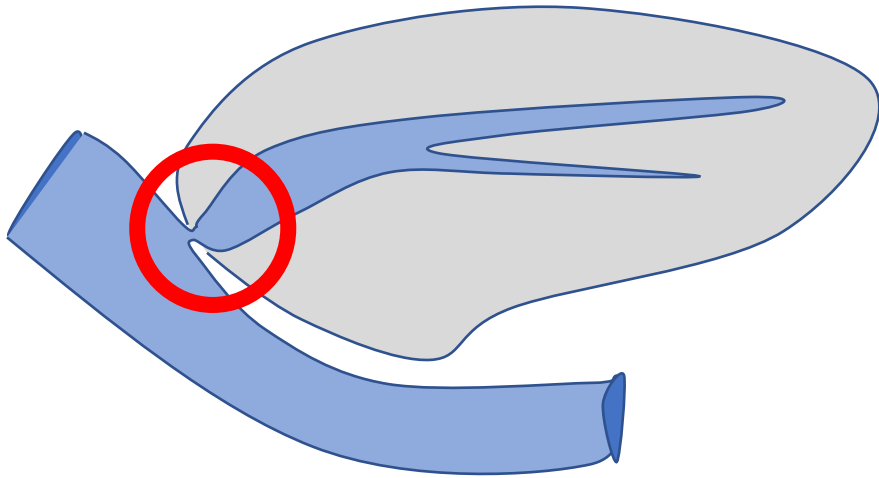
1

**The congested living donor graft with
suspected poor venous outflow**

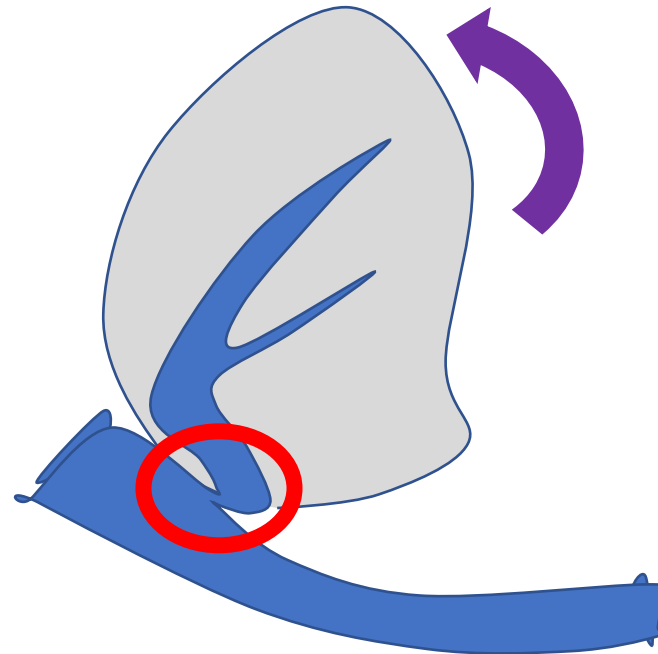
The congested living donor graft with suspected poor venous outflow

CAUSES

1: Technical



2: Iatrogenic

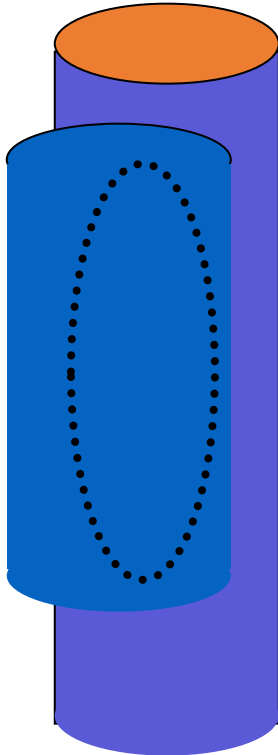


Option 3 ... = 1 + 2

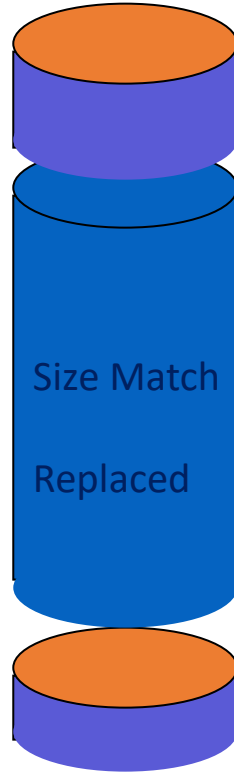
Vena Cava reconstruction

Thrombosis	1 %	10 %	1 %	-	-
Outflow-block	(few)	1 %	10 %	1 %	extremely rare

Cavo-Cavo
Plasty



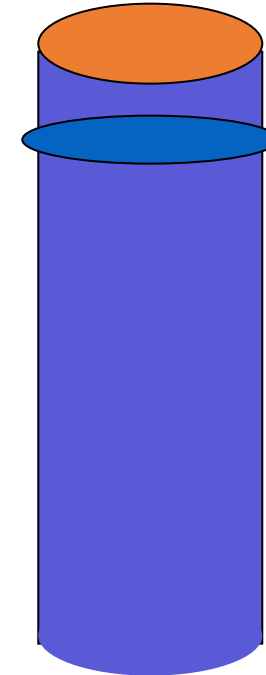
Size Match
Replaced



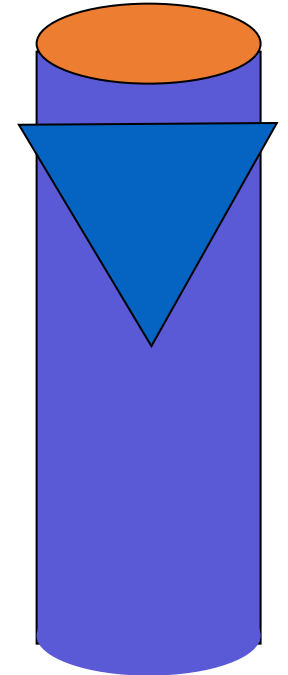
Large for
Size
Replaced
+ Tailored



Piggy-Back

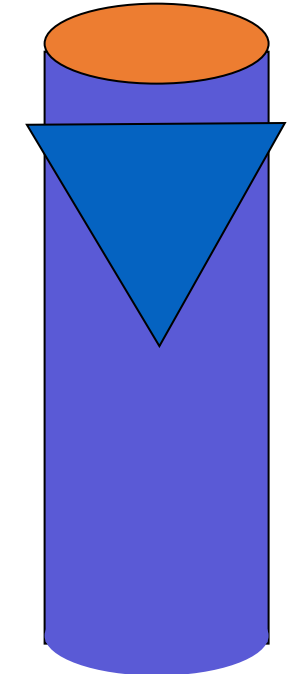
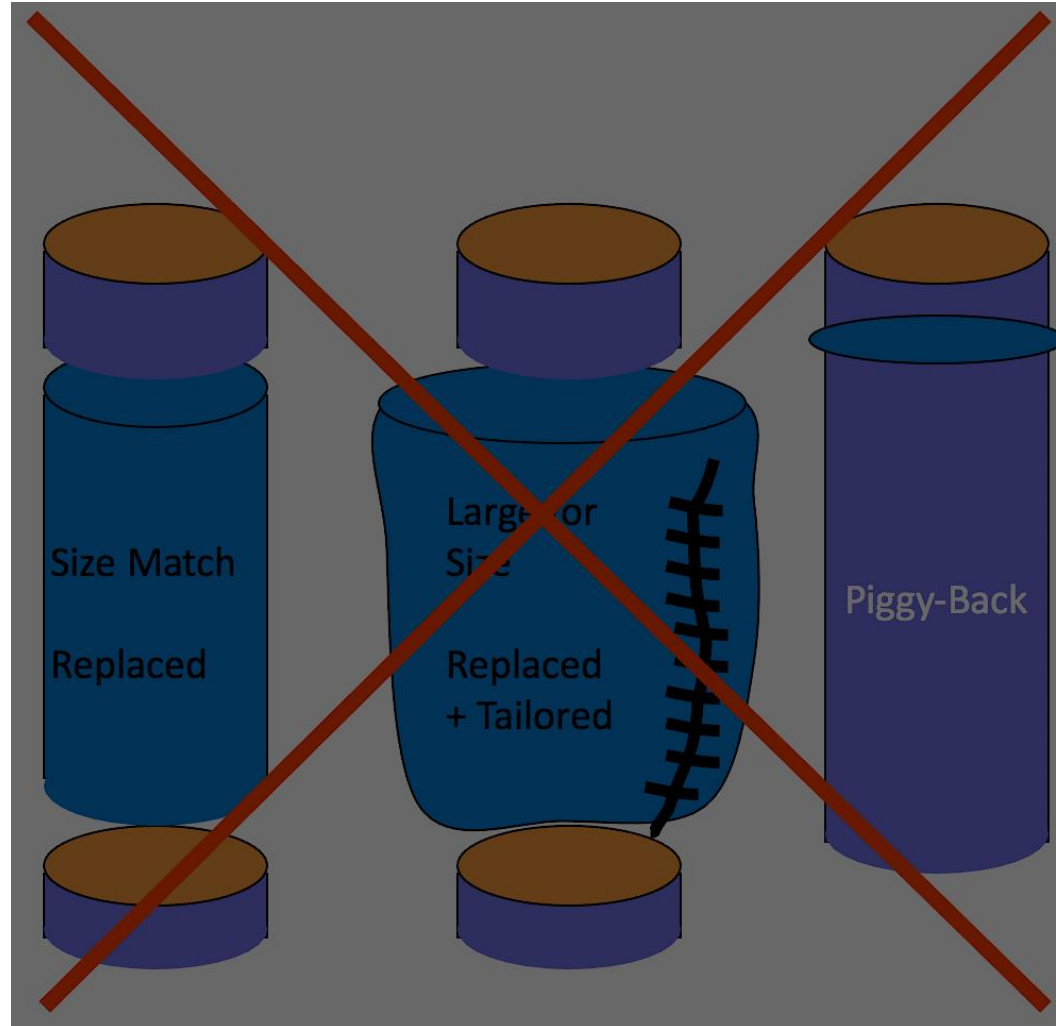
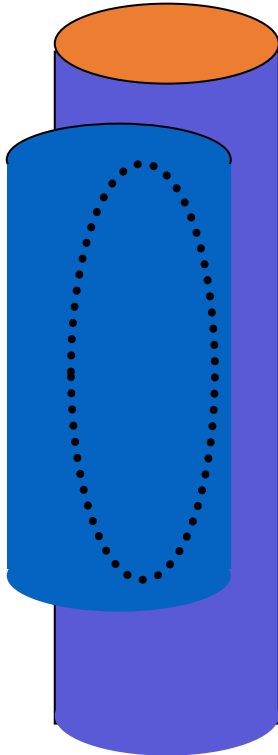


Triangular
Piggy-Back



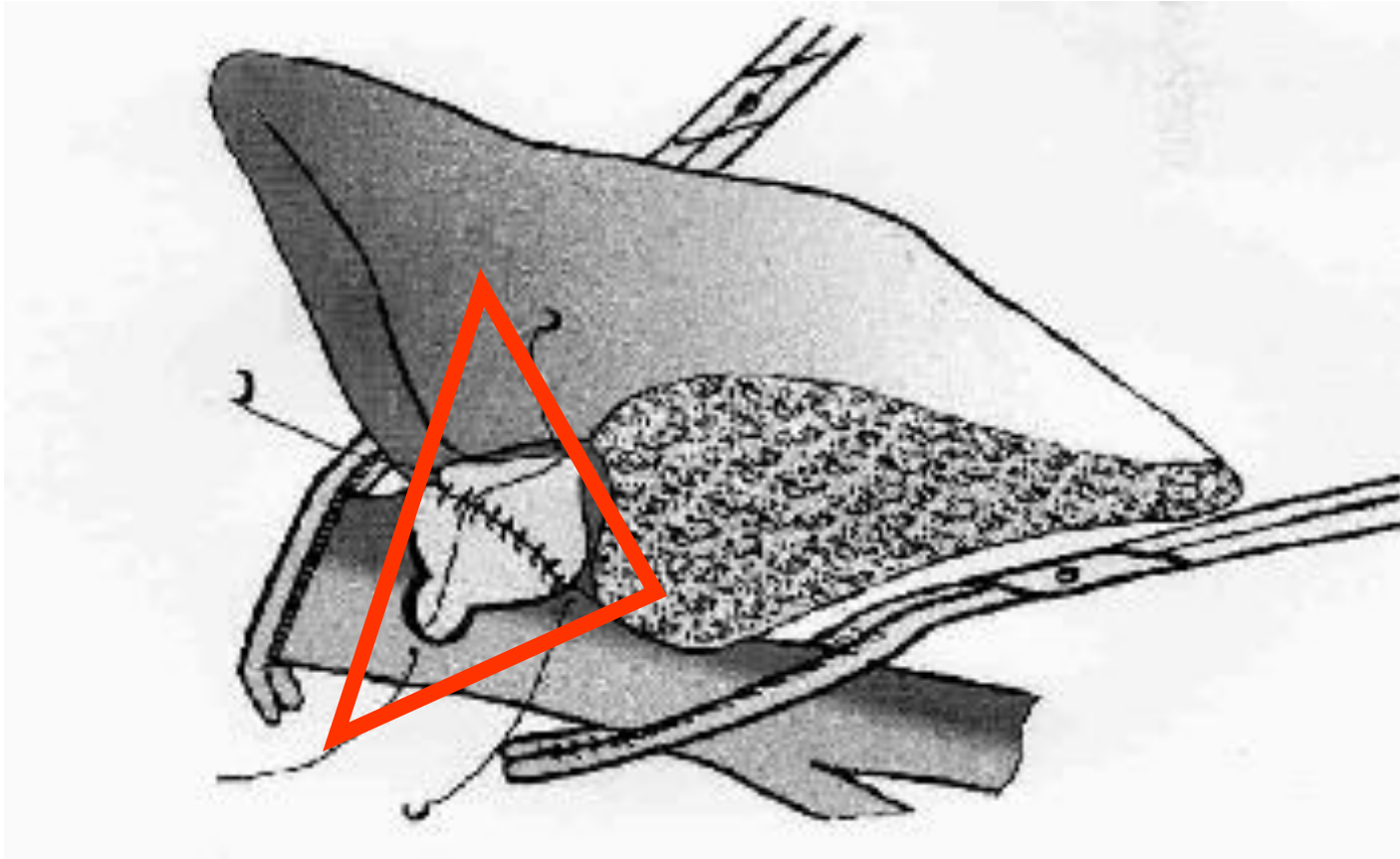
Vena Cava reconstruction

Cavo-Cavo
Plasty



**Triangular
Piggy-Back**

**Large Triangulated Piggy-Back
On the patch of the 3 recipient HV**

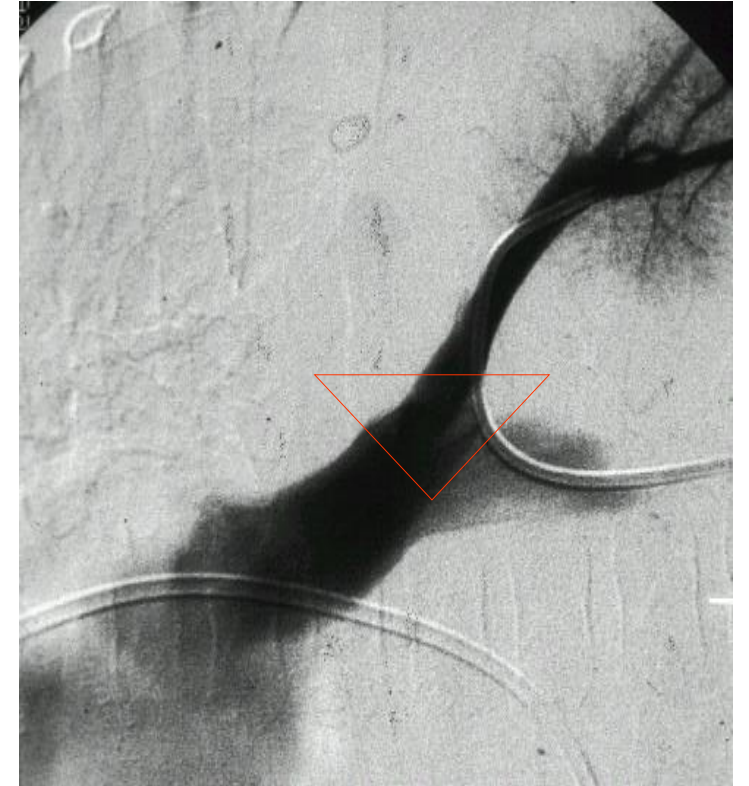
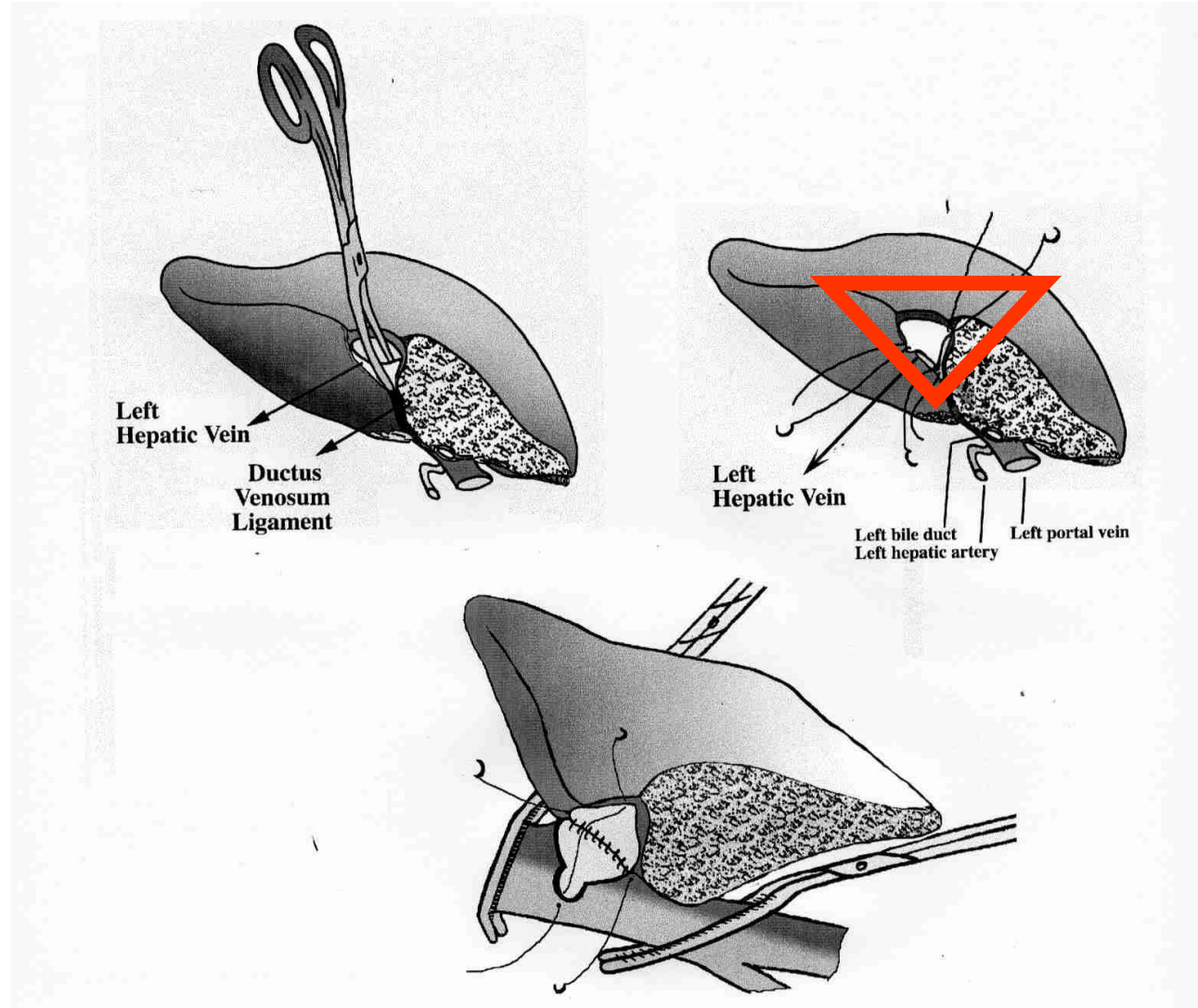


Triangulate Both Sides !

- . *Recipient vena cava*
- . *Graft Hepatic vein*

Triangular on Both Sides !

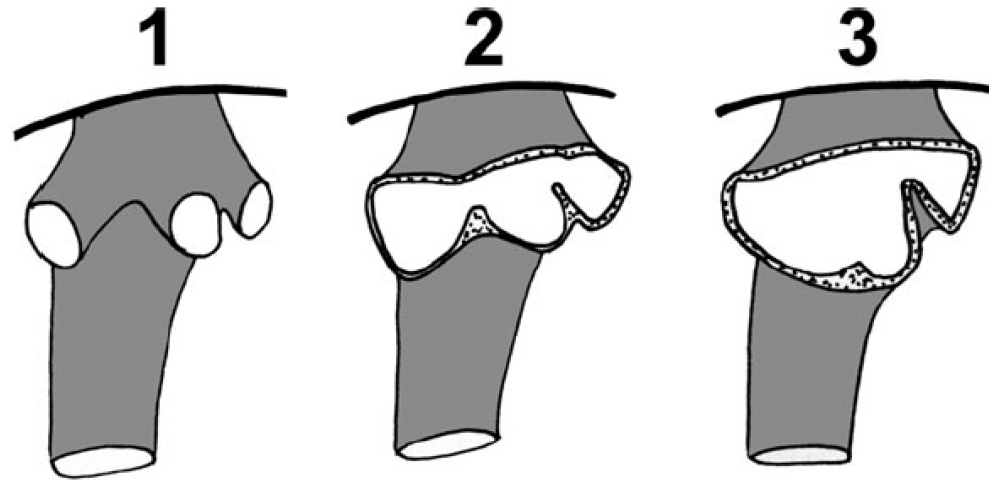
Create a triangle on the graft



**Difficult situations
for triangulation ?**

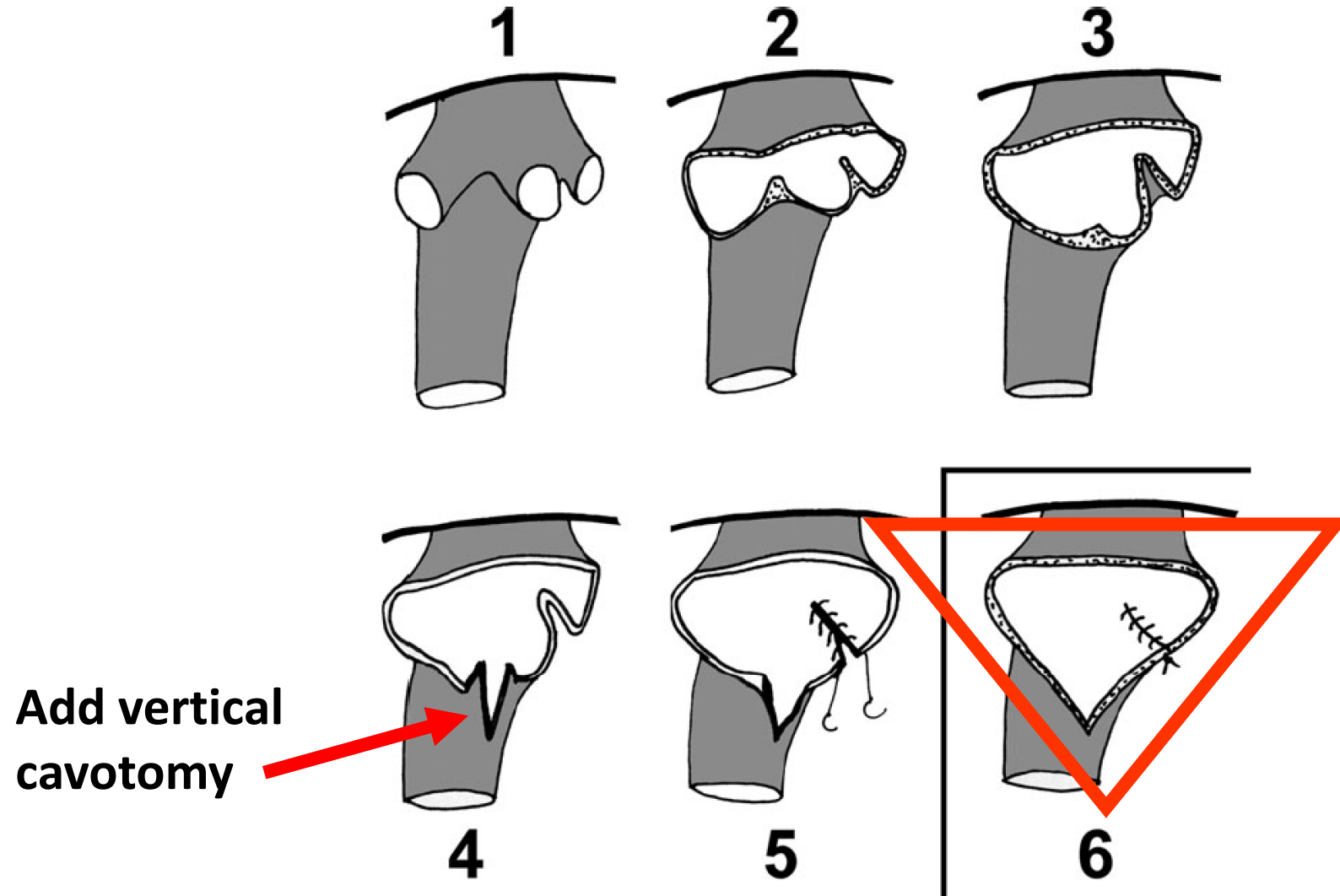
Hepatic venous reconstruction as the stake of the liver: technical note and thoughts.

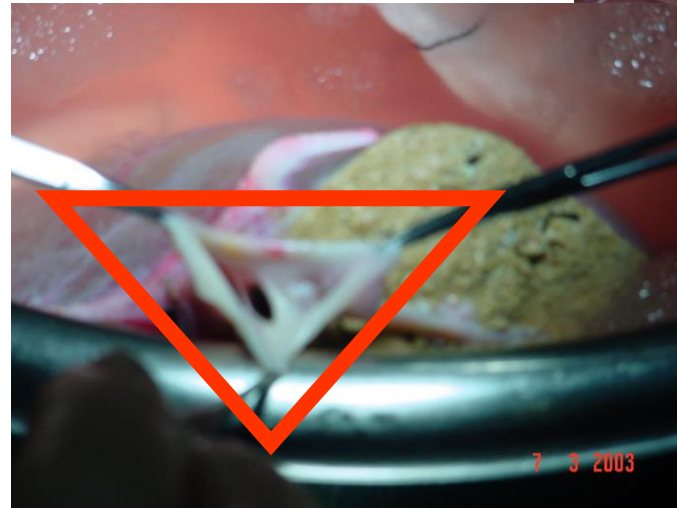
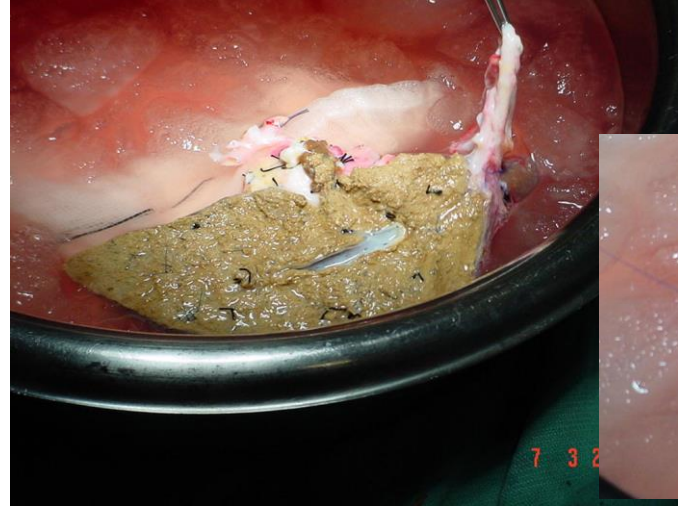
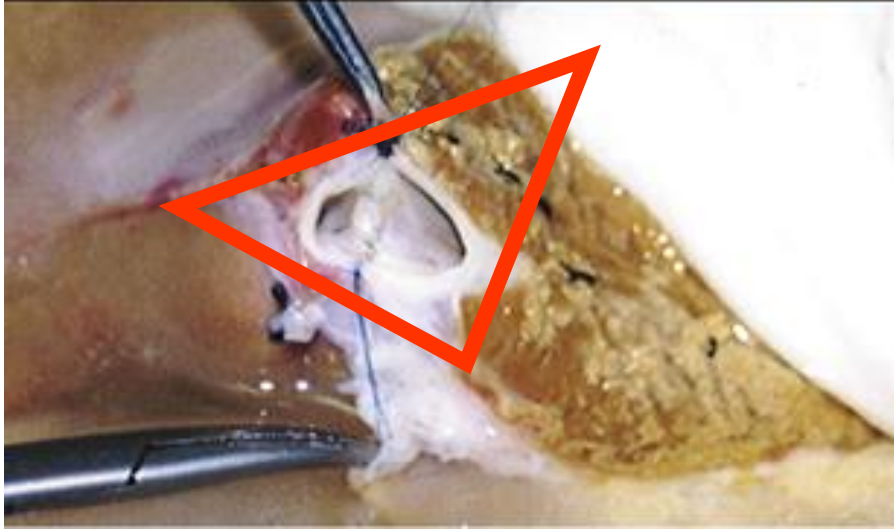
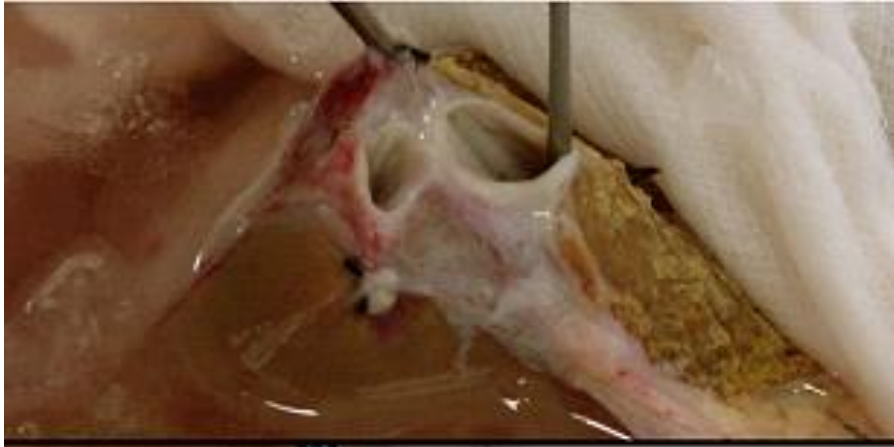
Emond JC, de Ville de Goyet J. Pediatr Transplant. 2014



Hepatic venous reconstruction as the stake of the liver: technical note and thoughts.

Emond JC, de Ville de Goyet J. Pediatr Transplant. 2014





**Technical tips on
« getting out of trouble in theatre »**

2

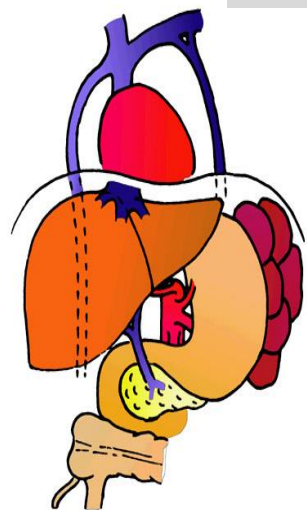
The poor portal inflow situation

The poor portal inflow situation

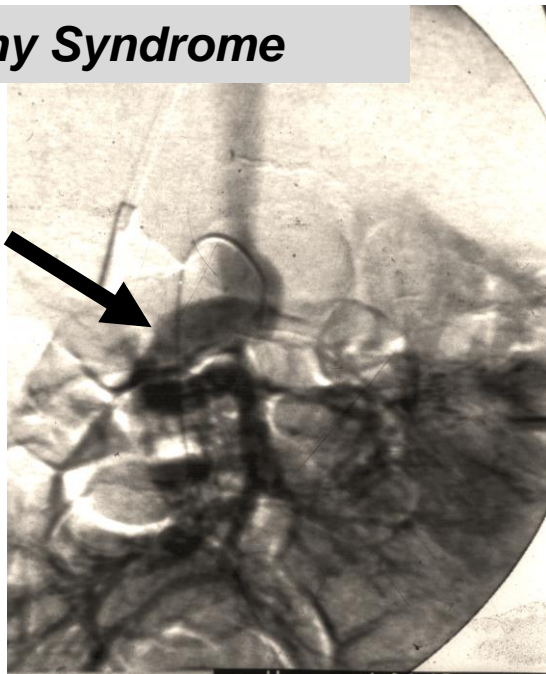
- **Portal vein absence** **Extremely rare**
- **Thrombosis of existing PV** **Extremely rare**
- **Portal vein hypoplasia (biliary atresia)** **Common**
- **Portal flow steal (collateral shunts)** **Very rare**

1 Portal vein absence

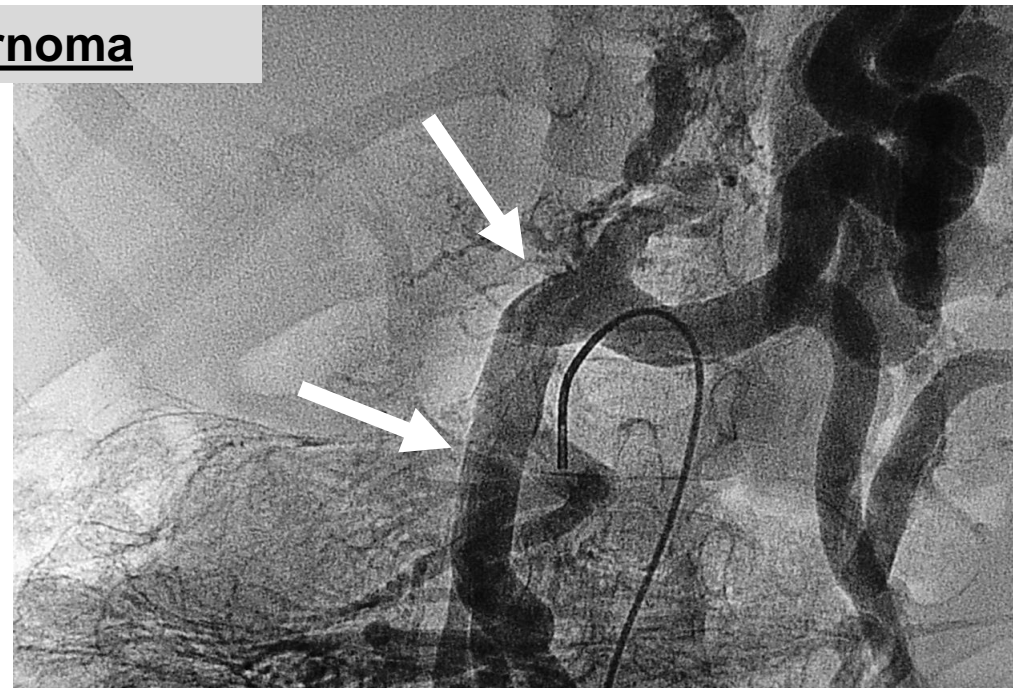
*Revascularize from Spleno-Mes Confluence,
or from SMV
or a large collateral*



Abernethy Syndrome



cavernoma



2

Thrombosis of existing PV

*Thrombectomy or
Revascularize from Spleno-Mes Confluence,
or from SMV*

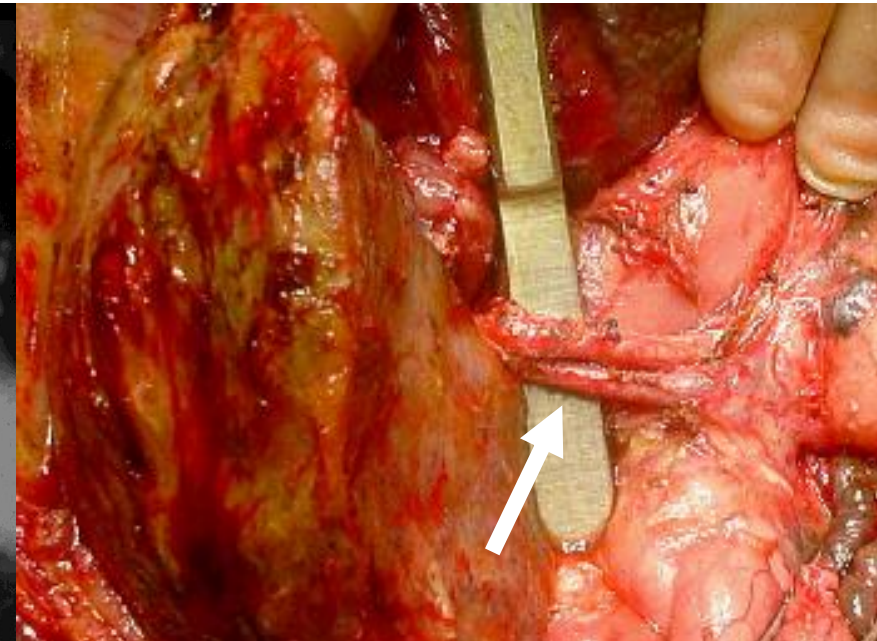
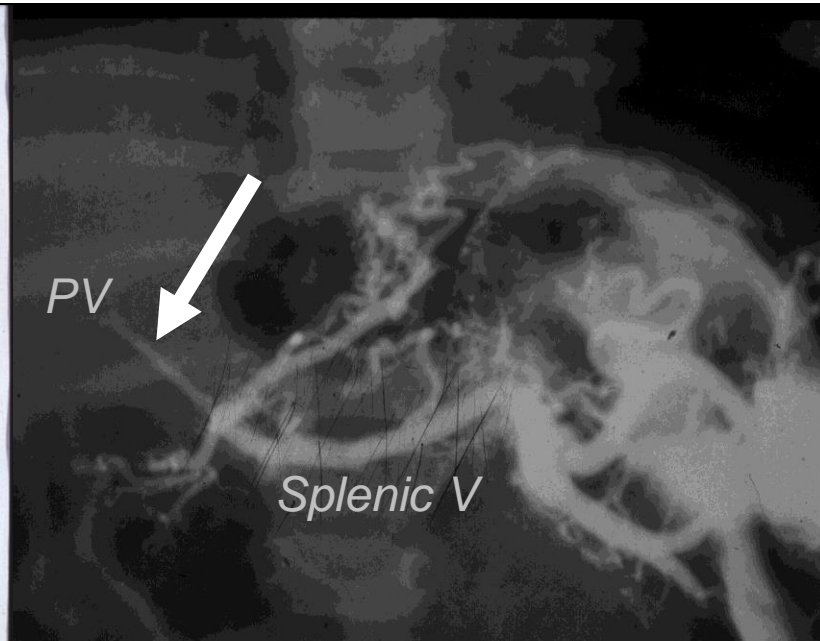
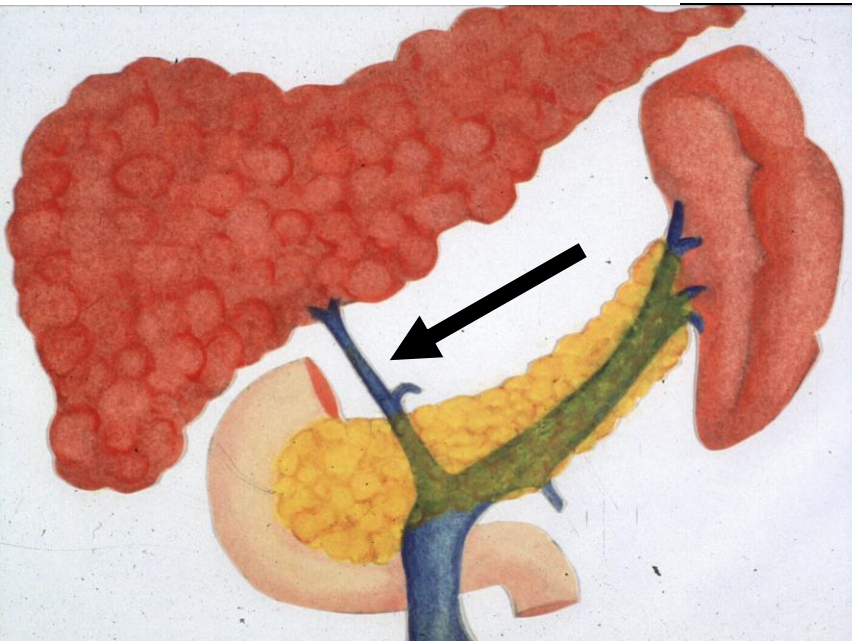


Low PV

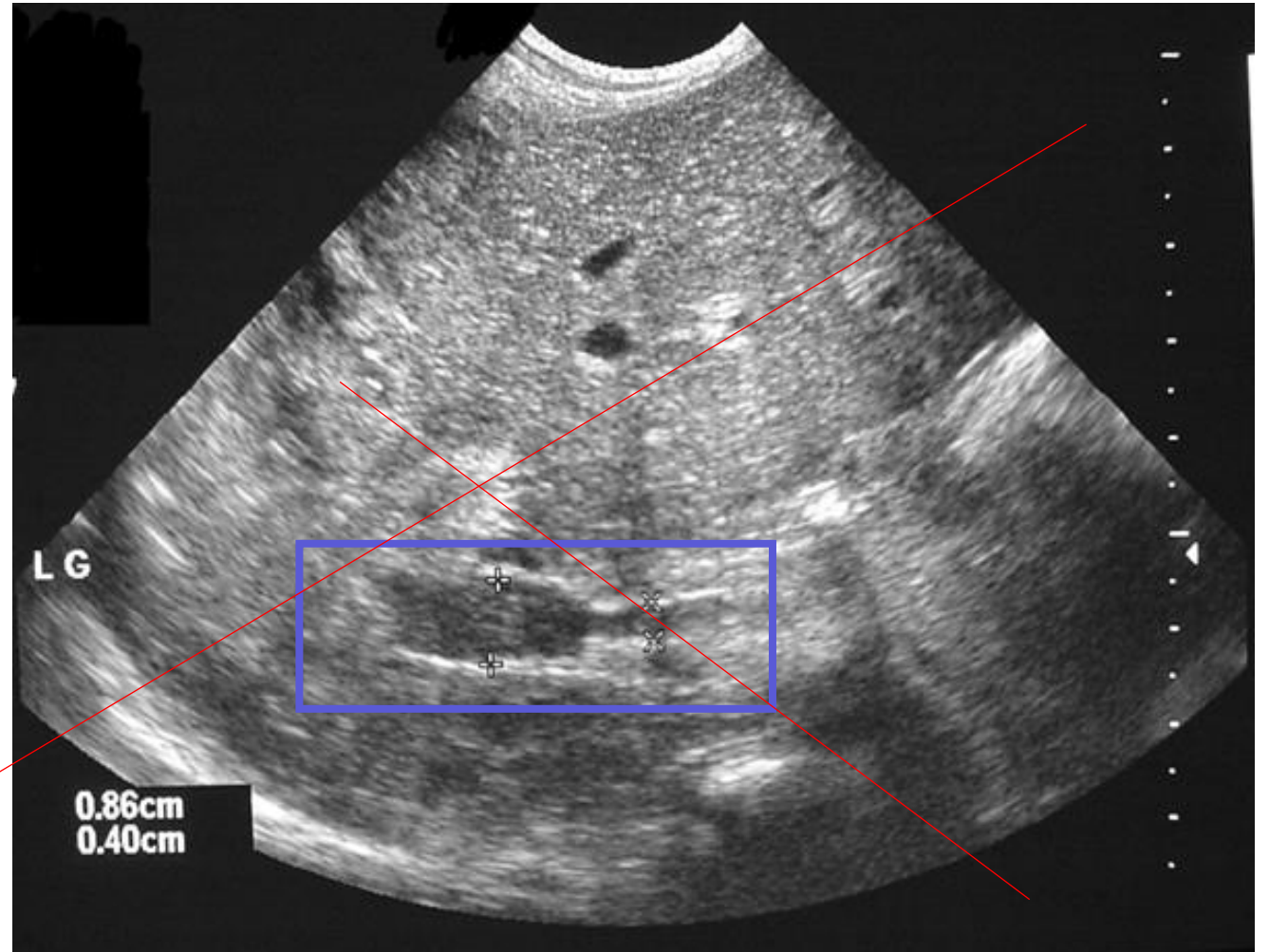
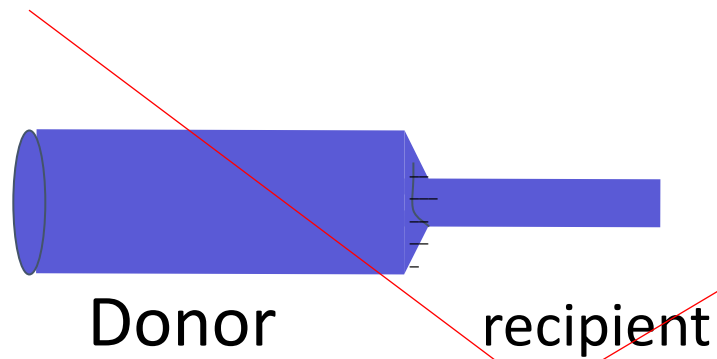
Spleno-Mes Confluence

SMV with a vein graft

3 Portal vein hypoplasia (biliary atresia).

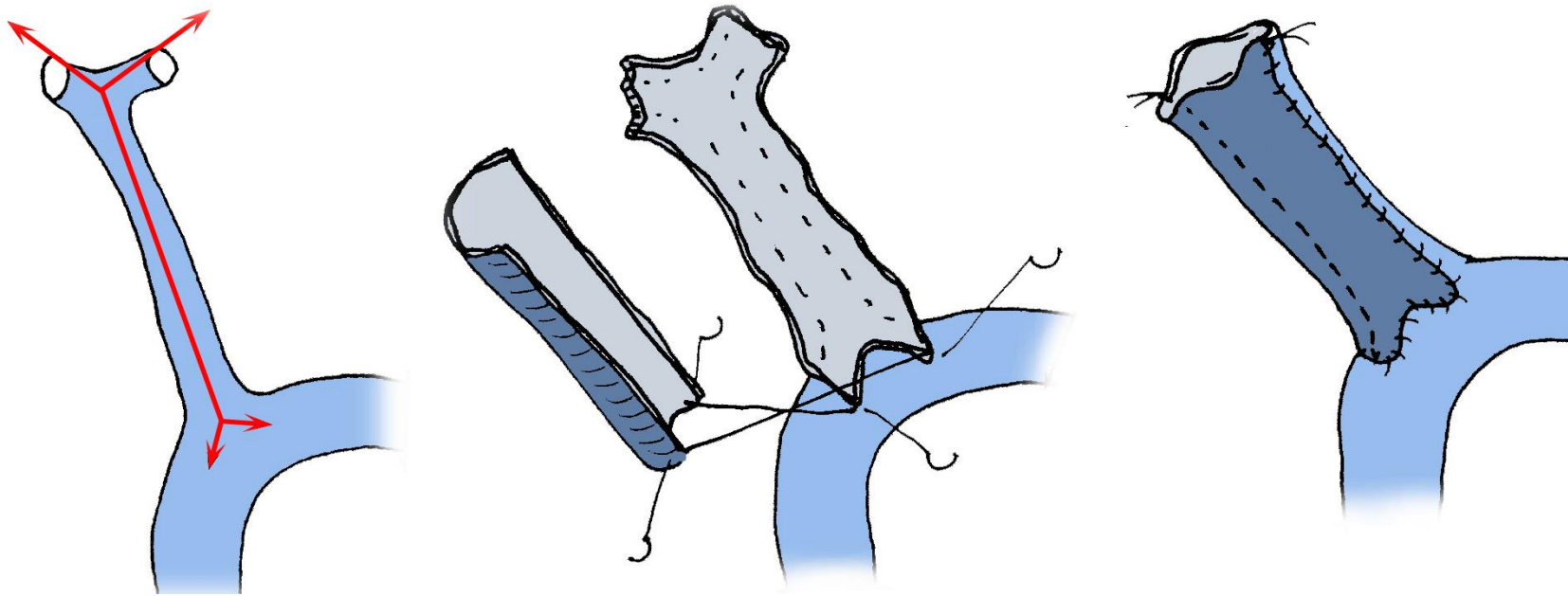


Reconstruction in cases with hypoplastic portal vein



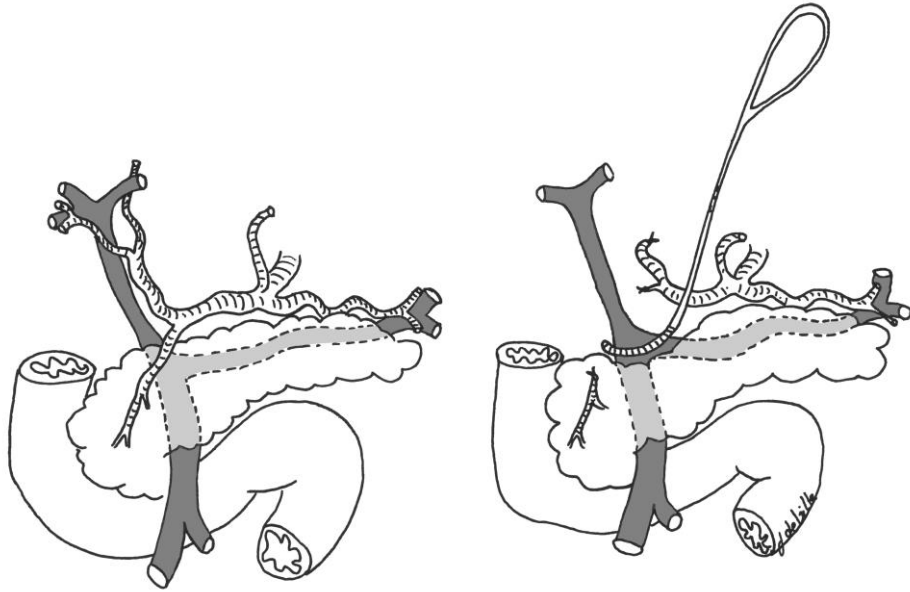
Reconstruction in cases with hypoplastic portal vein

*Innovative techniques for and results of portal vein reconstruction
in living-related liver transplantation.
Surgery. 1999 – K. Tanaka group*



Longitudinal Portal Venoplasty

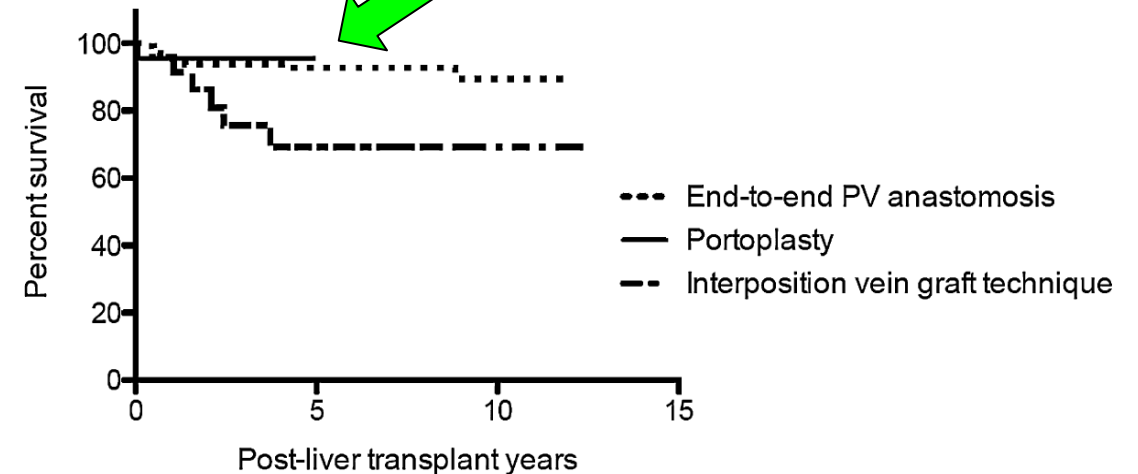
Reconstruction in cases with hypoplastic portal vein



PV Anastomosis Technique	5 Years Complication-Free Survival	10 Years Complication-Free Survival
Group 1	90.8%	87.5%
Group 2a	61.8%	61.8%
Group 2b	91.3%	No follow-up*

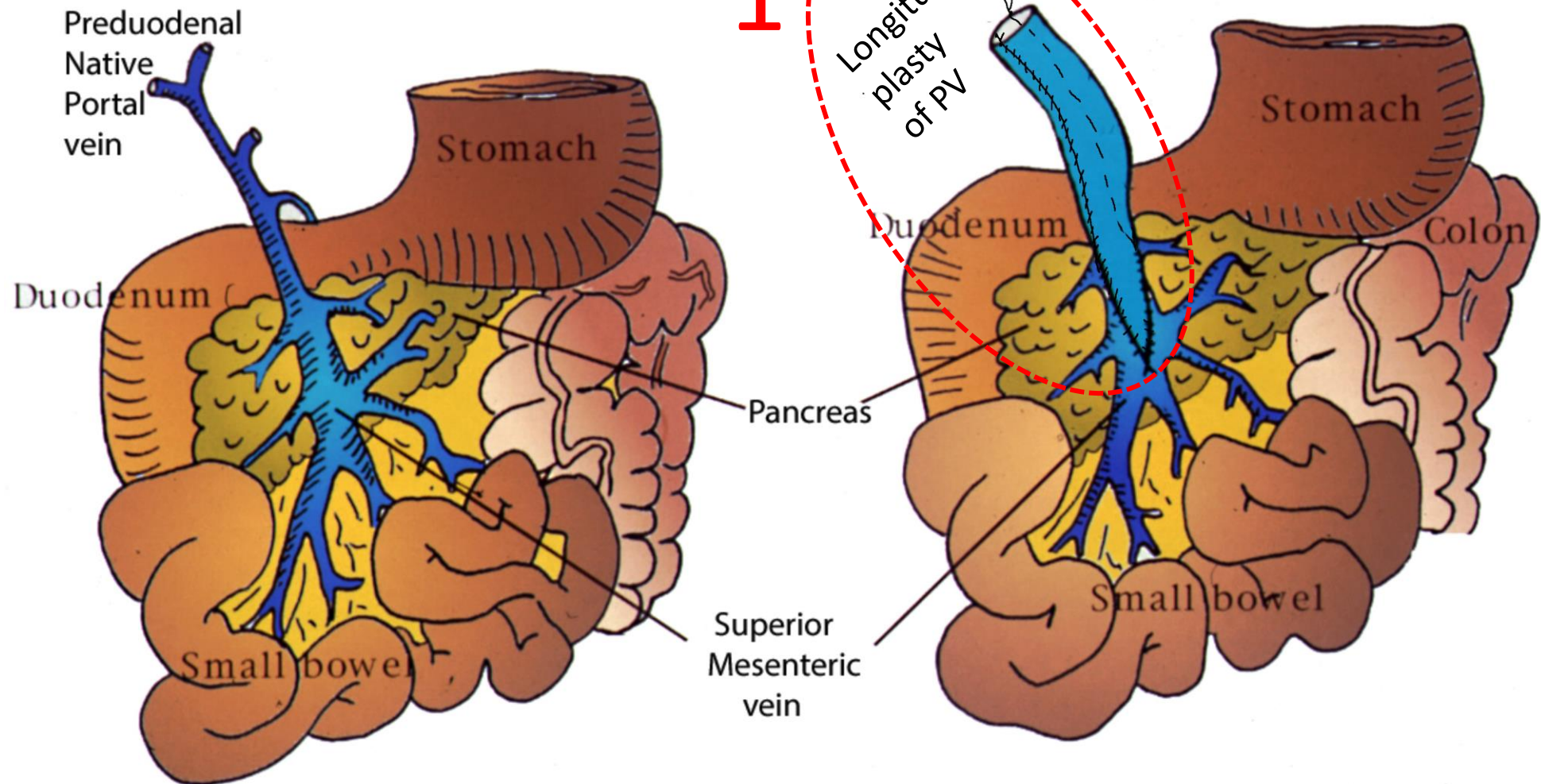
*No follow-up at 10 years for the portoplasty technique (first portoplasty done in 2003).

Group 1, end-to-end anastomosis without a vein graft; Group 2a, anastomosis with an interposition vein graft technique; Group 2b, anastomosis using a latero-lateral portoplasty ($P = 0.002$).



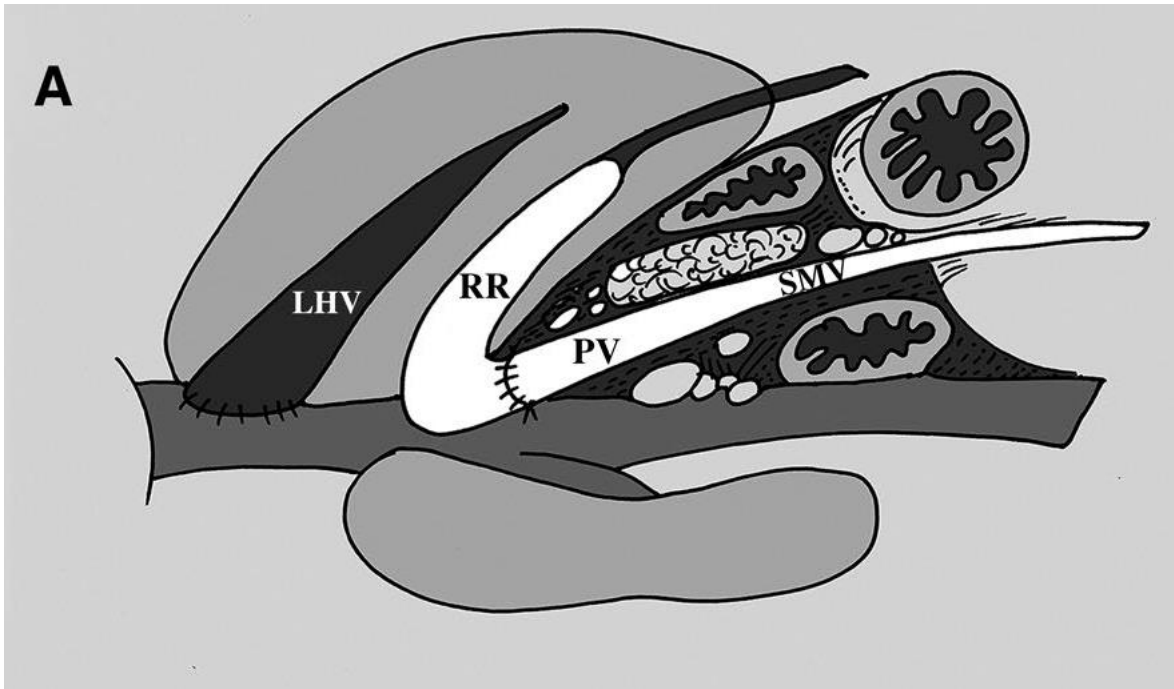
Catherine de Magnee et al. Ann Surg 2011

Hypoplastic Preduodenal PV



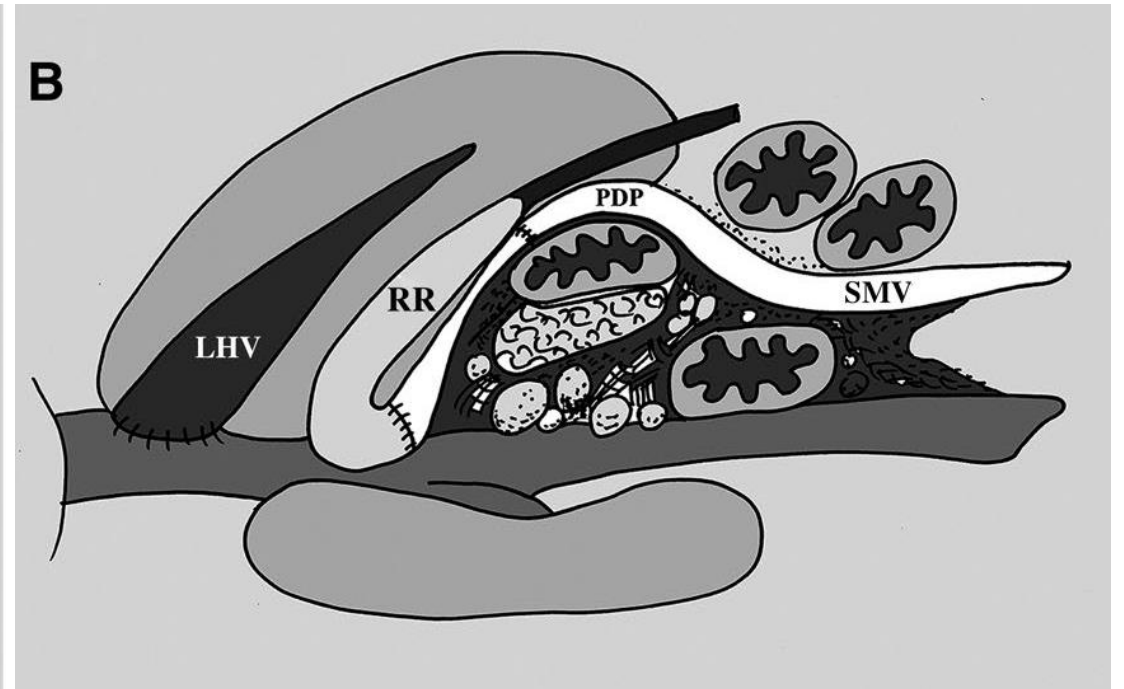
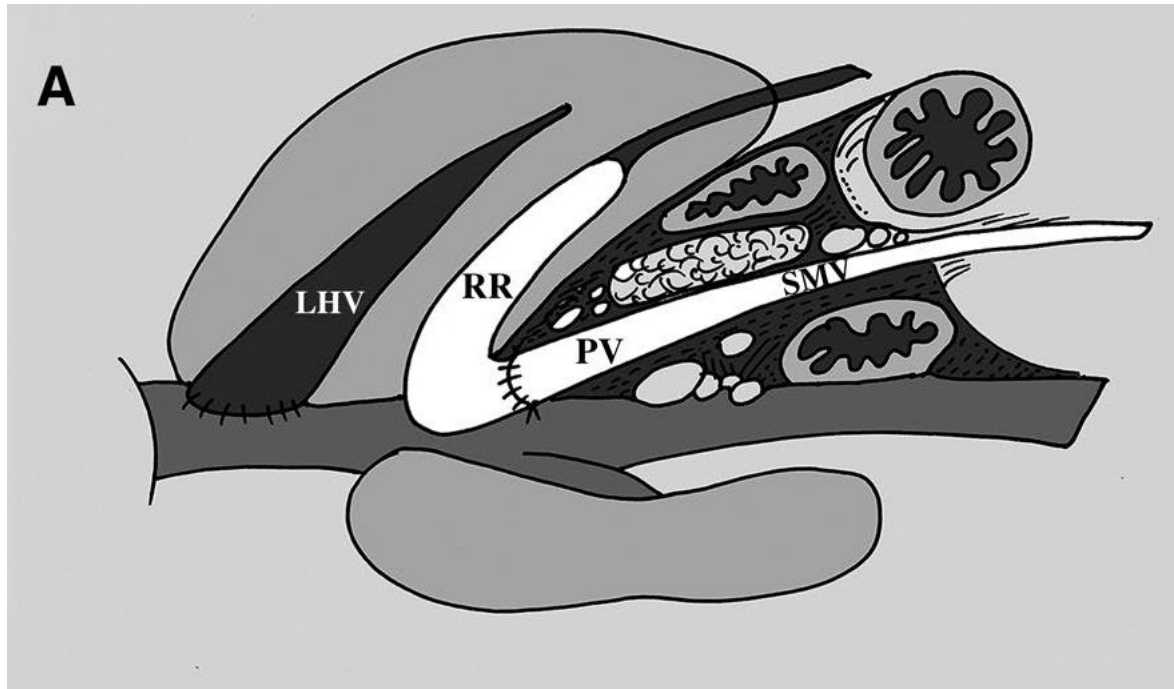
Preduodenal PV

Preduodenal Portal Vein Reconstruction at Liver Transplantation:
The Challenges and a Solution.
Liver Transpl. 2019



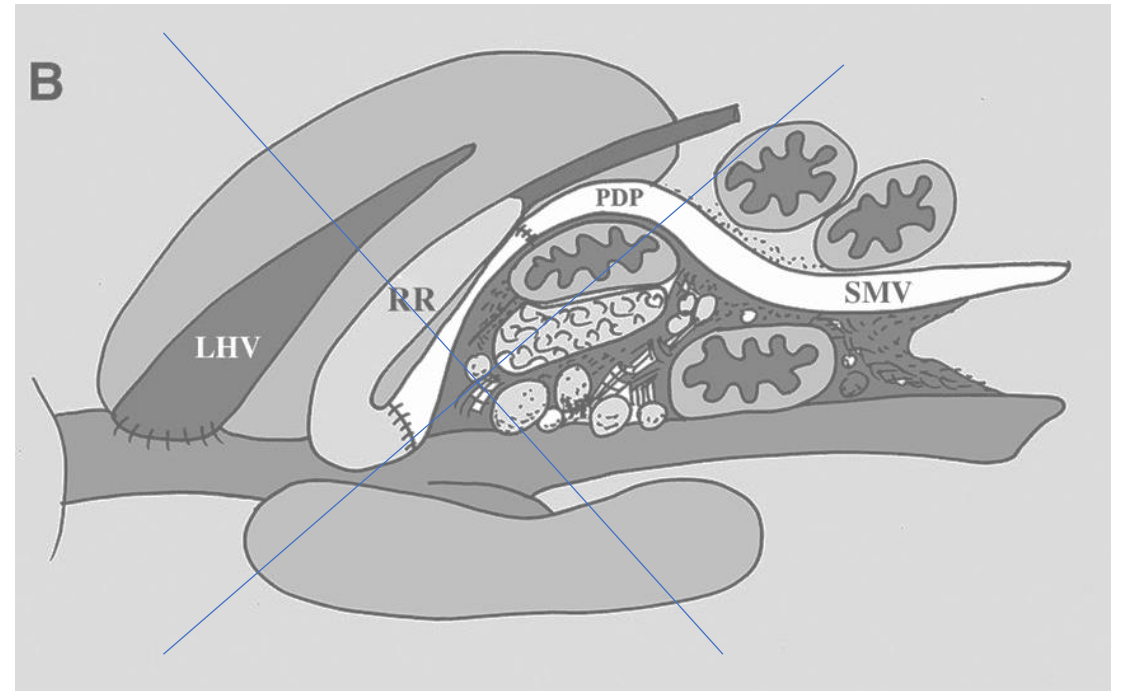
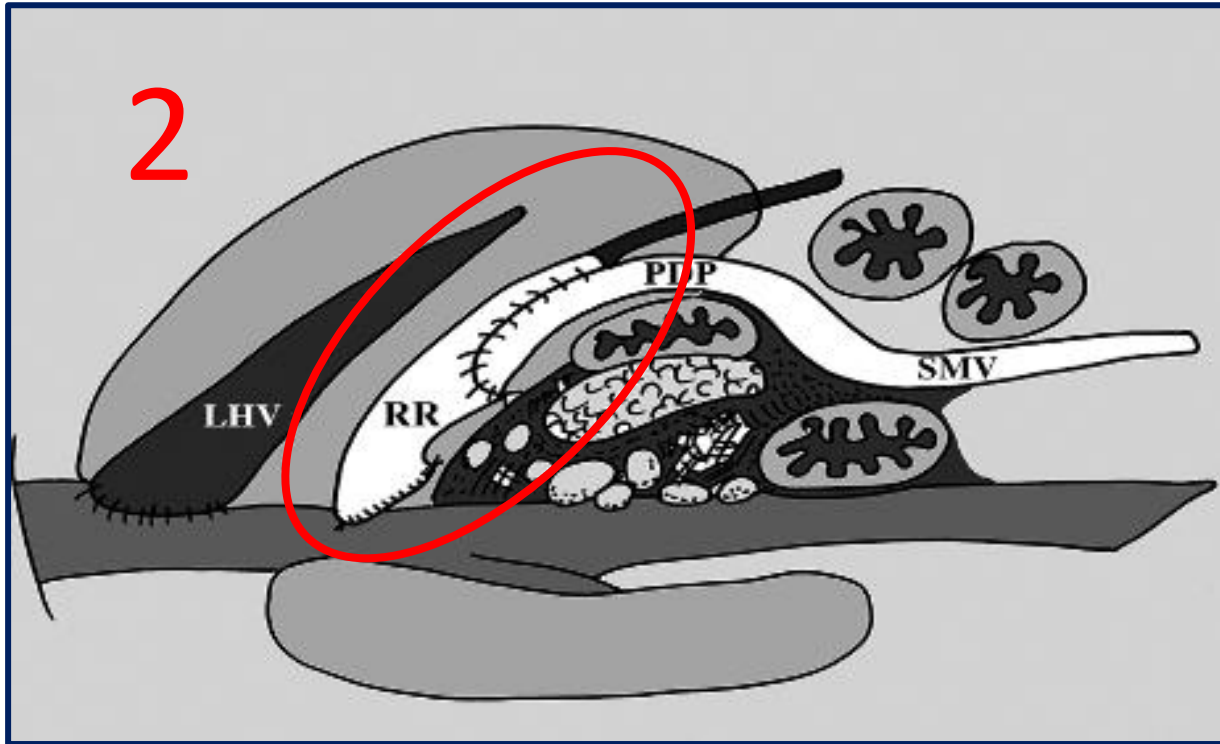
Predudodenal PV

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Liver Transpl. 2019



Preduodenal PV

Preduodenal Portal Vein Reconstruction at Liver Transplantation:
The Challenges and a Solution.
Liver Transpl. 2019



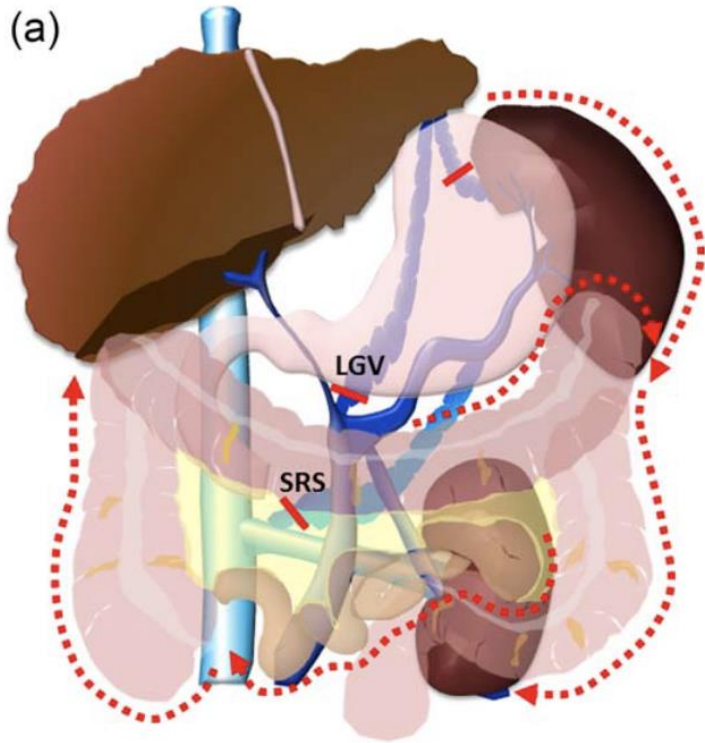
4 Portal flow steal (collateral shunts)

4 Portal flow steal (collateral shunts)



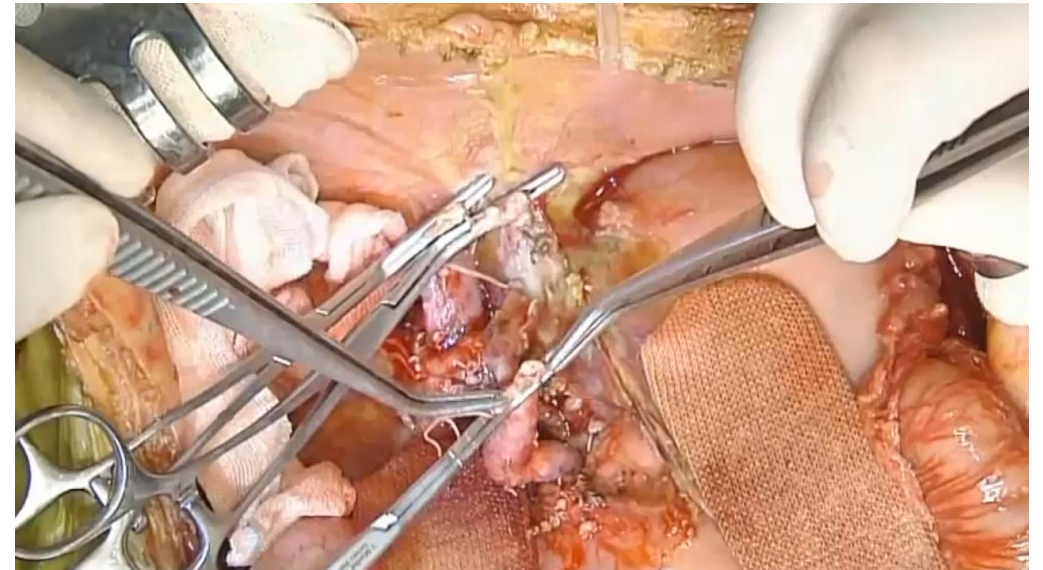
Courtesy of
Prof Mureo
Kasahara
National Children's Hospital,
Tokyo, Japan

Portal flow steal (collateral shunts)



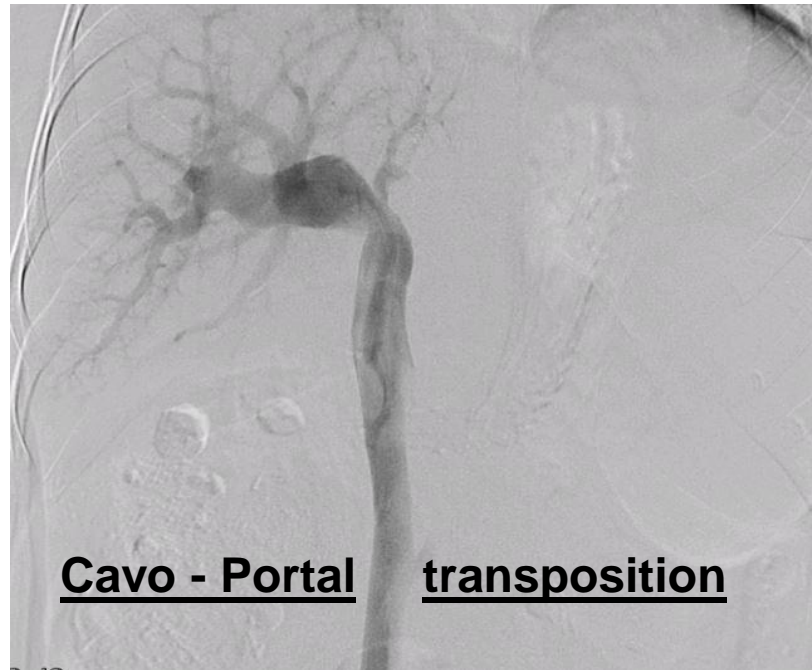
Efficacy of intraoperative cine-portogram for complicated portal vein reconstruction in pediatric living donor liver transplantation. Uchida H, et al. Pediatr Transplant. 2021

A novel technique for collateral interruption to maximize portal venous flow in pediatric liver transplantation. Sakamoto S et al. Liver Transpl. 2018



5 The very very poor portal inflow situation...

When nothing works and you are desperate



Cavo - Portal transposition

**Technical tips on
« getting out of trouble in theatre »**

3

The arterial inflow problem :

jump graft size discrepancy with the graft artery

**Avoid complex reconstructions
and vascular graft interposition**

**A single and direct anastomosis
whenever possible**

Direct
(single)
anastomosis

No-bypass
reconstruction

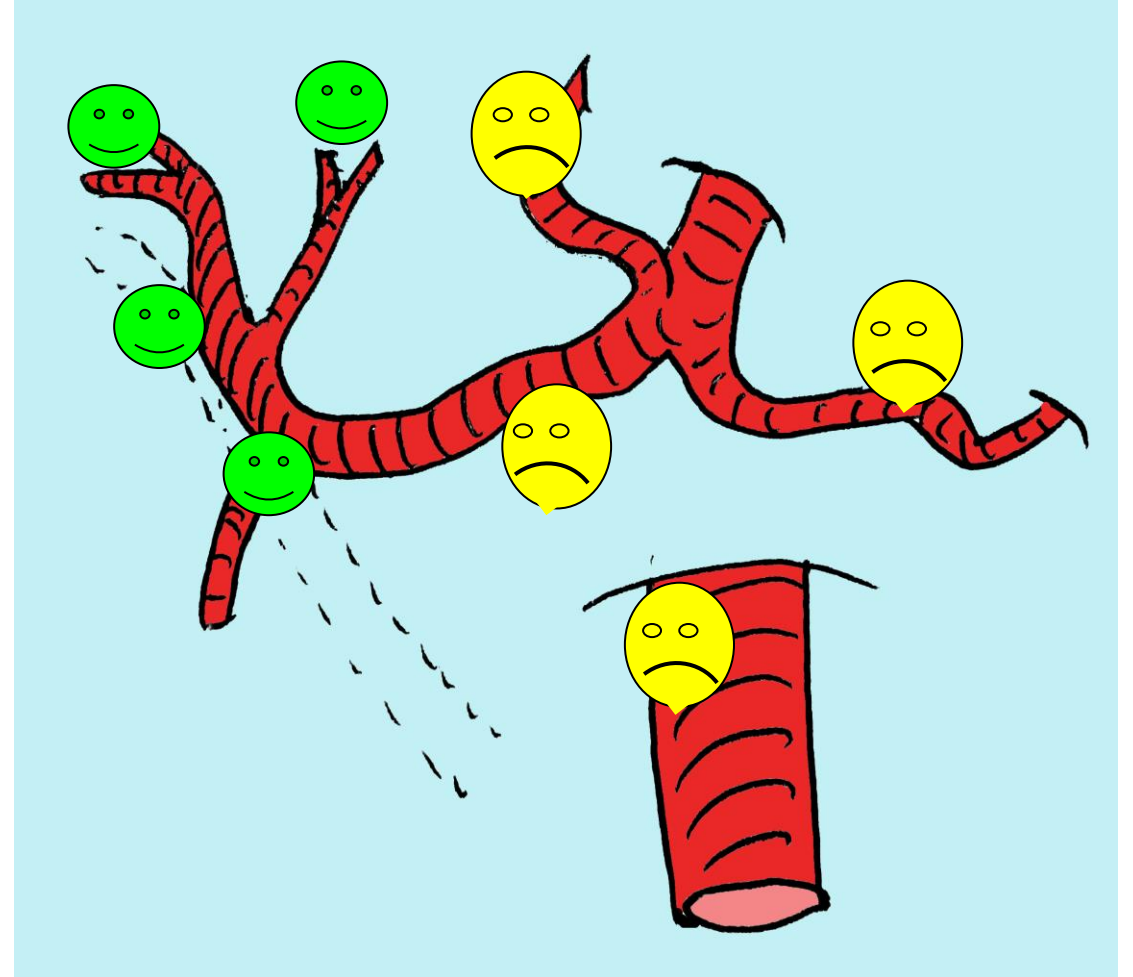
Bifurc-patch

RHA

LHA

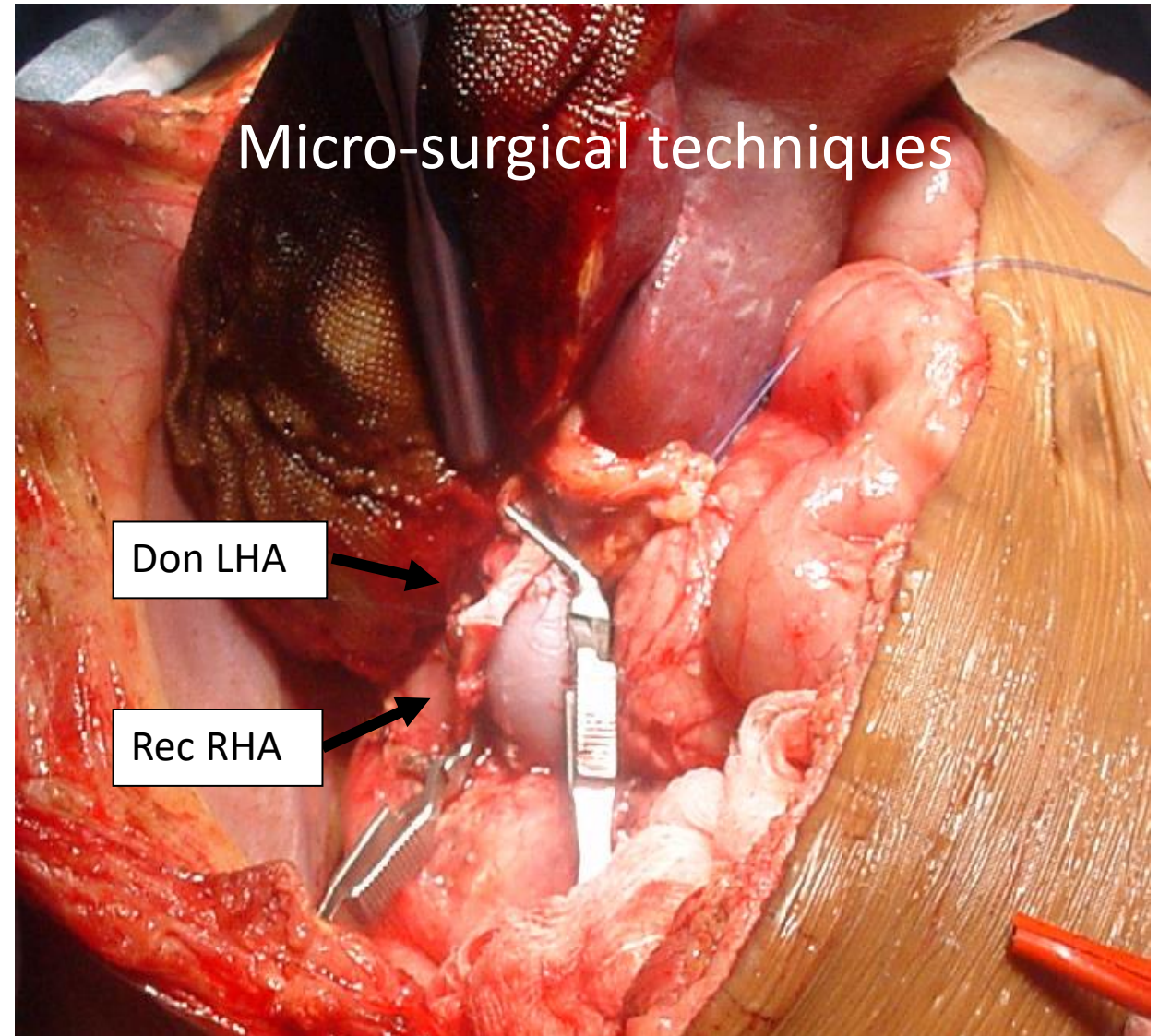
PHA

GDA



Direct
(single)
anastomosis

No-bypass
reconstruction



*Aggressive prevention and preemptive management of vascular complications after pediatric liver transplantation: A major impact on graft survival and long-term outcome.
Pediatr Transplant. 2018.*

126 first isolated pediatric liver transplants *(All indication types)*

2008 to 2015

- *microvascular techniques*
- *Intra- and post-operative close monitoring for early diagnosis*
- *Immediate management of any flow abnormality*
- *Customized anticoagulation protocol*

Donor type	Living	38 (30.2%)
	Postmortem	88 (69.8%)
Donor/recipient weight ratio		5.6 ± 3.6 (0.6-15.94)
Graft type	Whole liver	22 (17.5%)
	Extended right lobe	4 (3.2%)
	Reduced graft	6 (5.5%)
	Left lateral segment	88 (70.6%)
	Hyperreduced (segment II)	6 (4.0%)

*Aggressive prevention and preemptive management
of vascular complications after pediatric liver
transplantation: A major impact on
graft survival and long-term outcome.
Pediatr Transplant. 2018.*

126 first isolated pediatric liver transplants

(All indication types)

**In all but one patient,
recipient arterial anastomosis site was
the proper or common HA**

in a single case, the graft was vascularized
from the aorta with an aortic conduit
(iliac arterial graft from the same donor).

*Aggressive prevention and preemptive management
of vascular complications after pediatric liver
transplantation: A major impact on
graft survival and long-term outcome.
Pediatr Transplant. 2018.*

126 first isolated pediatric liver transplants

(All indication types)

No graft loss secondary to
Vascular thrombosis or
Primary non/dys-function

8-year Graft survival: 96.5 %

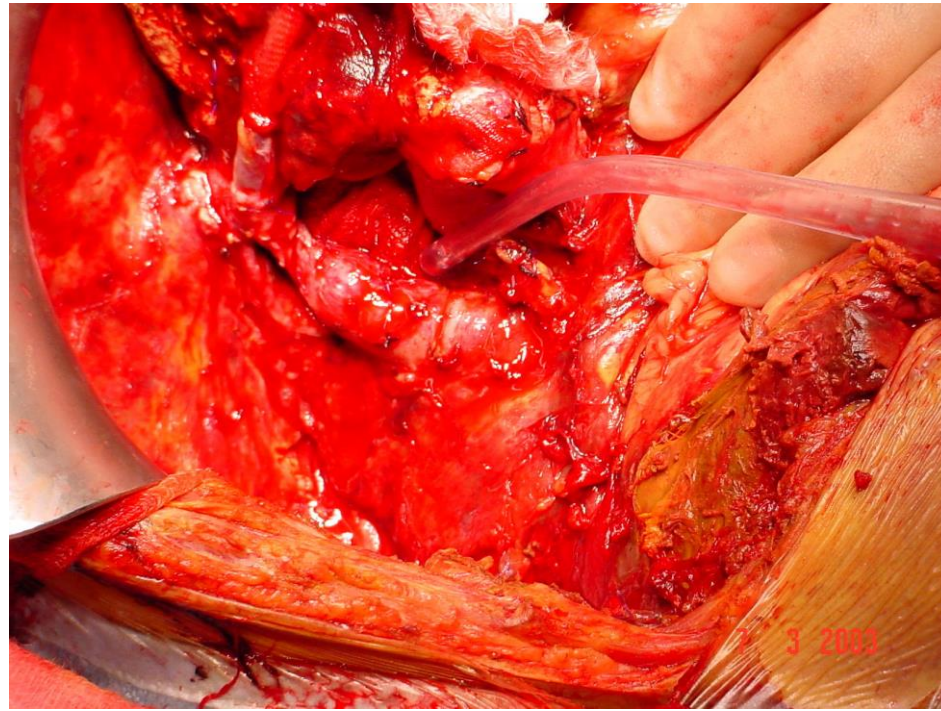
- **Microvascular surgical techniques**
- **Repeated intra/peri-operative US Doppler**
- **Immediate action in case of flow abnormalities**
- **Customized anticoagulation protocol**

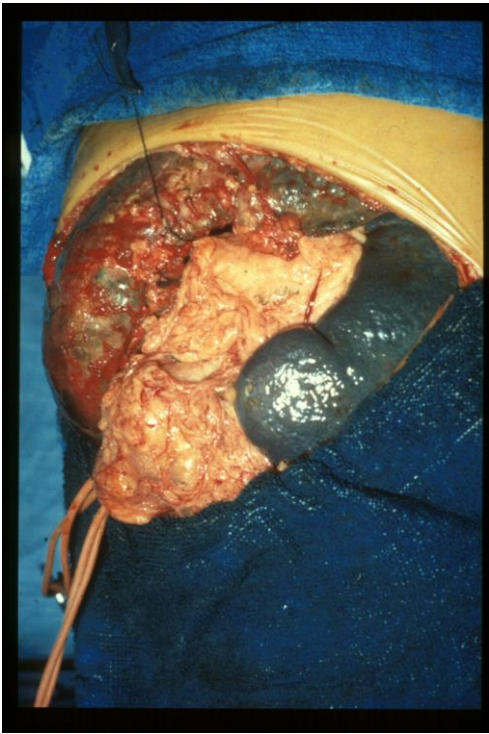


Technical tips on « getting out of trouble in theatre »

4

Approaching massive bleeding during explants

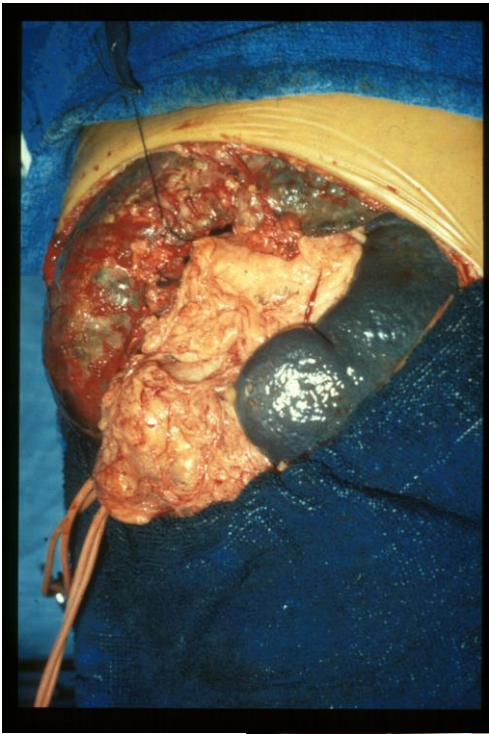




Portal hypertension
Coagulopathy
Thrombopenia
Adhesions



Bleeding
Transfusions

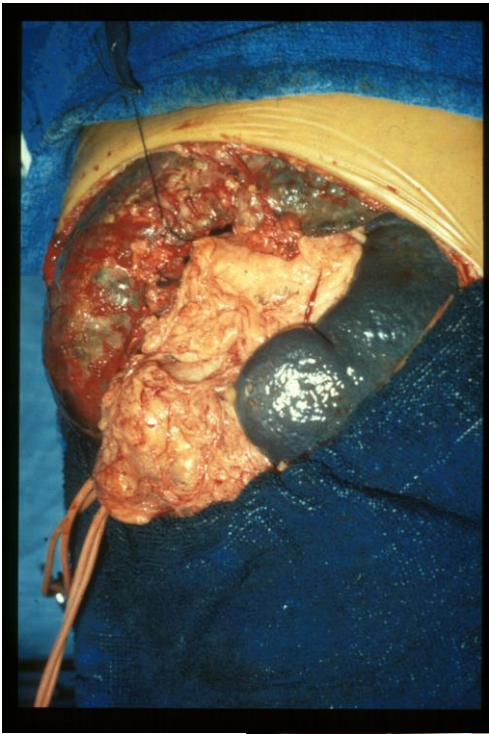


Portal hypertension
Coagulopathy
Thrombopenia
Adhesions



Cut surface
Anastomosis
Venous stasis

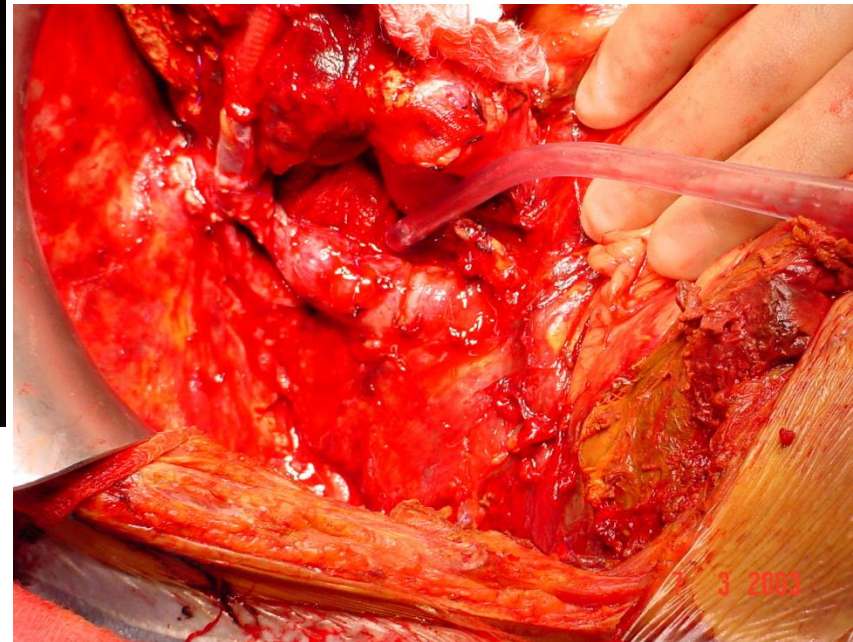
Bleeding
Transfusions



Portal hypertension
Coagulopathy
Thrombopenia
Adhesions



Cut surface
Anastomosis
Venous stasis



Bleeding
Transfusions

**More Bleeding
More Transfusions**

Reperfusion syndrome
Fibrinolysis

No «Tricks»

...

Mostly «Strategies»

No «Tricks»

Avoid extreme-end-stage condition

- listing patients at the right time
- and avoid prolonged waiting time

...

Mostly «Strategies»

Selection of donors

- avoid suboptimal donors for split

Perform liver split IN-SITU

Implement a Living donation program

No «Tricks»

Avoid extreme-end-stage condition
- listing patients at the right time
- and avoid prolonged waiting time

...

Mostly «Strategies»

Selection of donors
- avoid suboptimal donors for split

Perform liver split IN-SITU

Implement a Living donation program

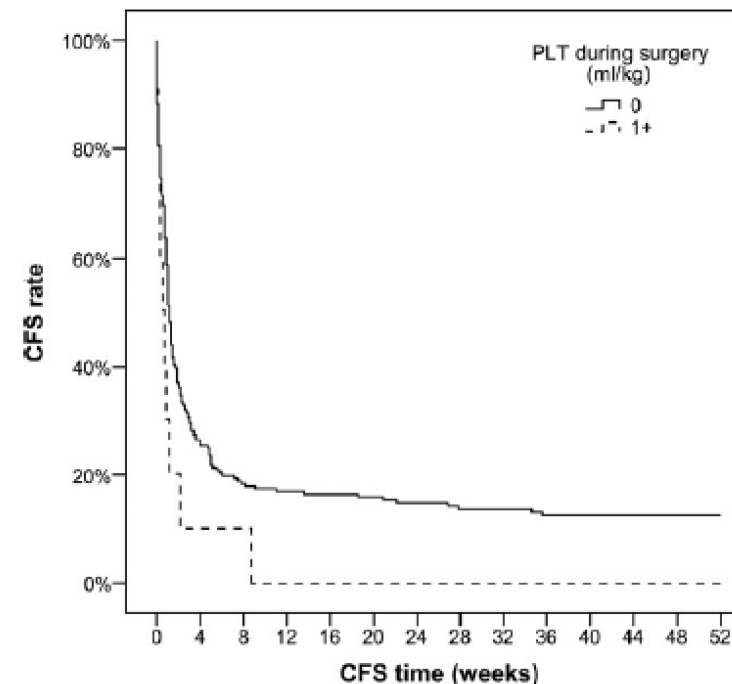
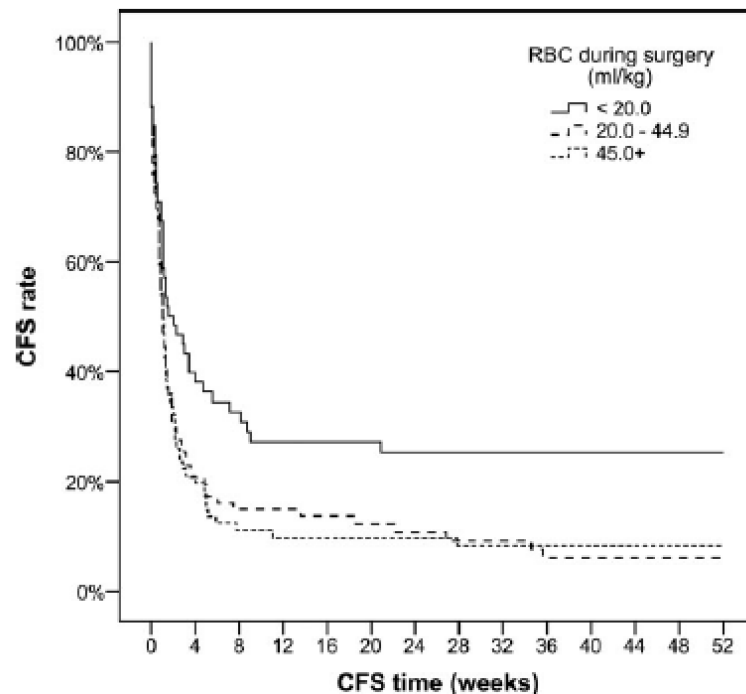
Adapting surgical techniques

Optimize reconstructions and vascular flows

Be obsessed by preventing blood loss all along

Postoperative complications in cirrhotic pediatric deceased donor liver transplantation:
Focus on transfusion therapy. Nacoti M et al. Pediatric Transplantation. 2017

Intra-operative Red blood cells and Platelet transfusions are independent risk factors for developing one or more major complications in the first year after PLTx.



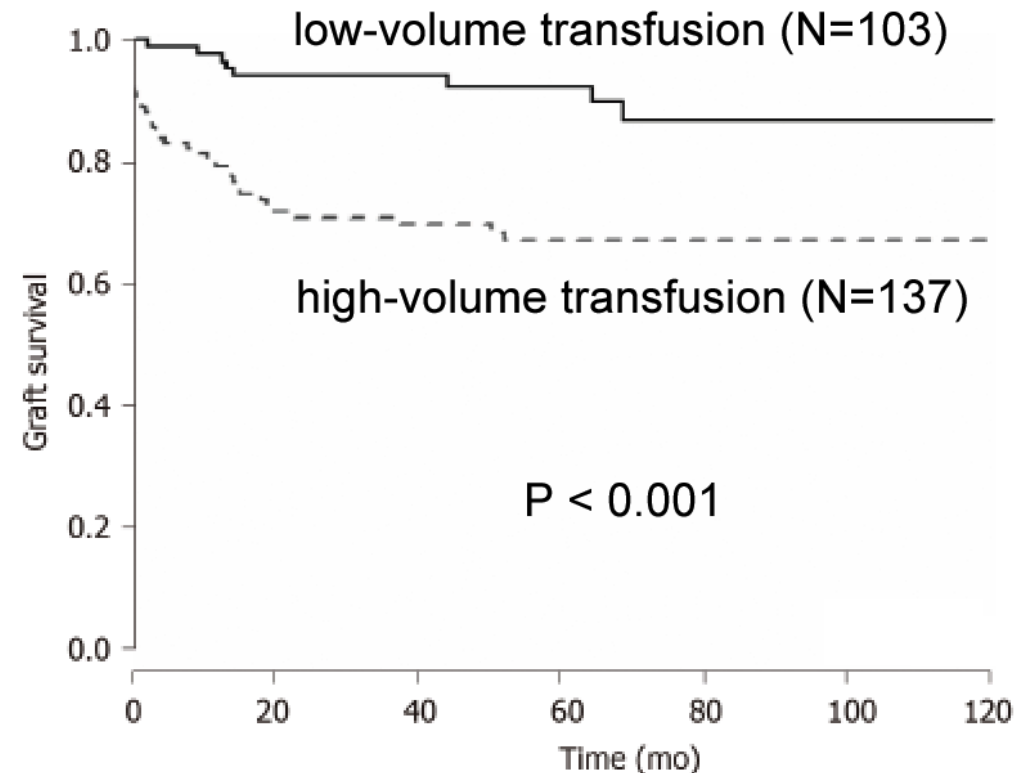
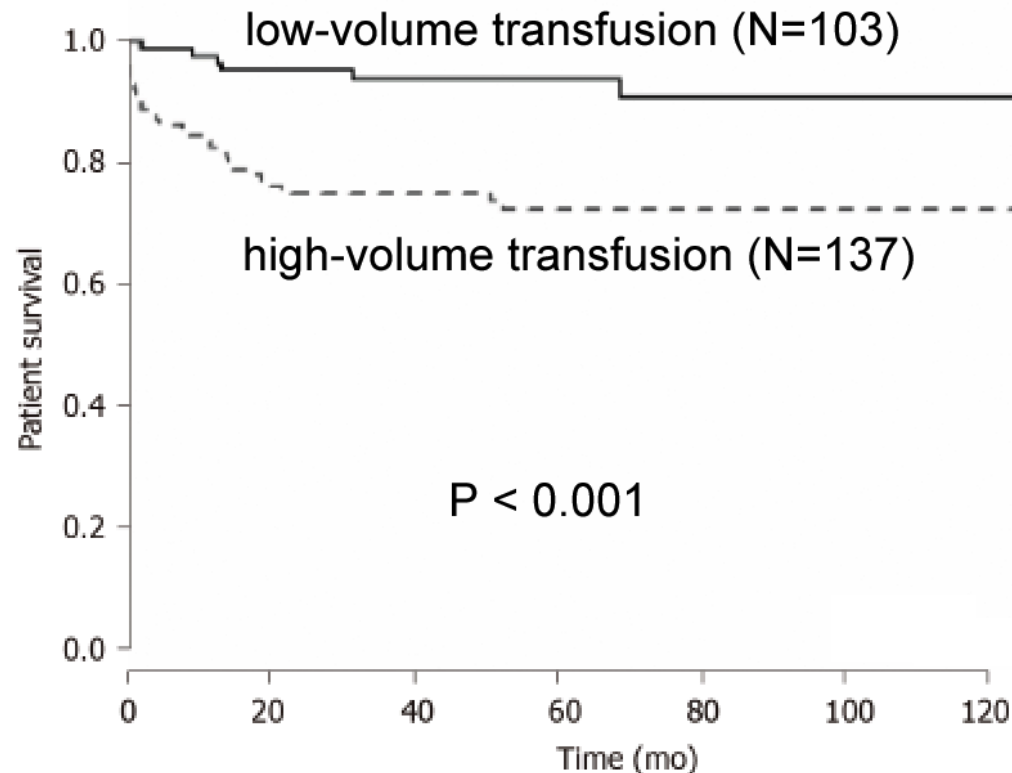
232 pediatric liver transplants over a 12 years period (2002-2013)

*Kaplan-Meier curves representing **cumulative patient complications (CFS)-free survival** in relation to amount of Blood or Platelets transfused during surgery*

Perioperative blood transfusion decreases long-term survival in pediatric living donor liver transplantation. *Gordon K et al. World J Gastroenterol* **2021**

First LDLT in 254 pediatric patients weighing up to 20 kg with non-acute liver diseases

Transfusion of RBC volume higher than 27.5 mL/kg during the perioperative period is associated with a significant increase in short- and long-term postoperative morbidity and mortality after pediatric living donor liver transplantation.



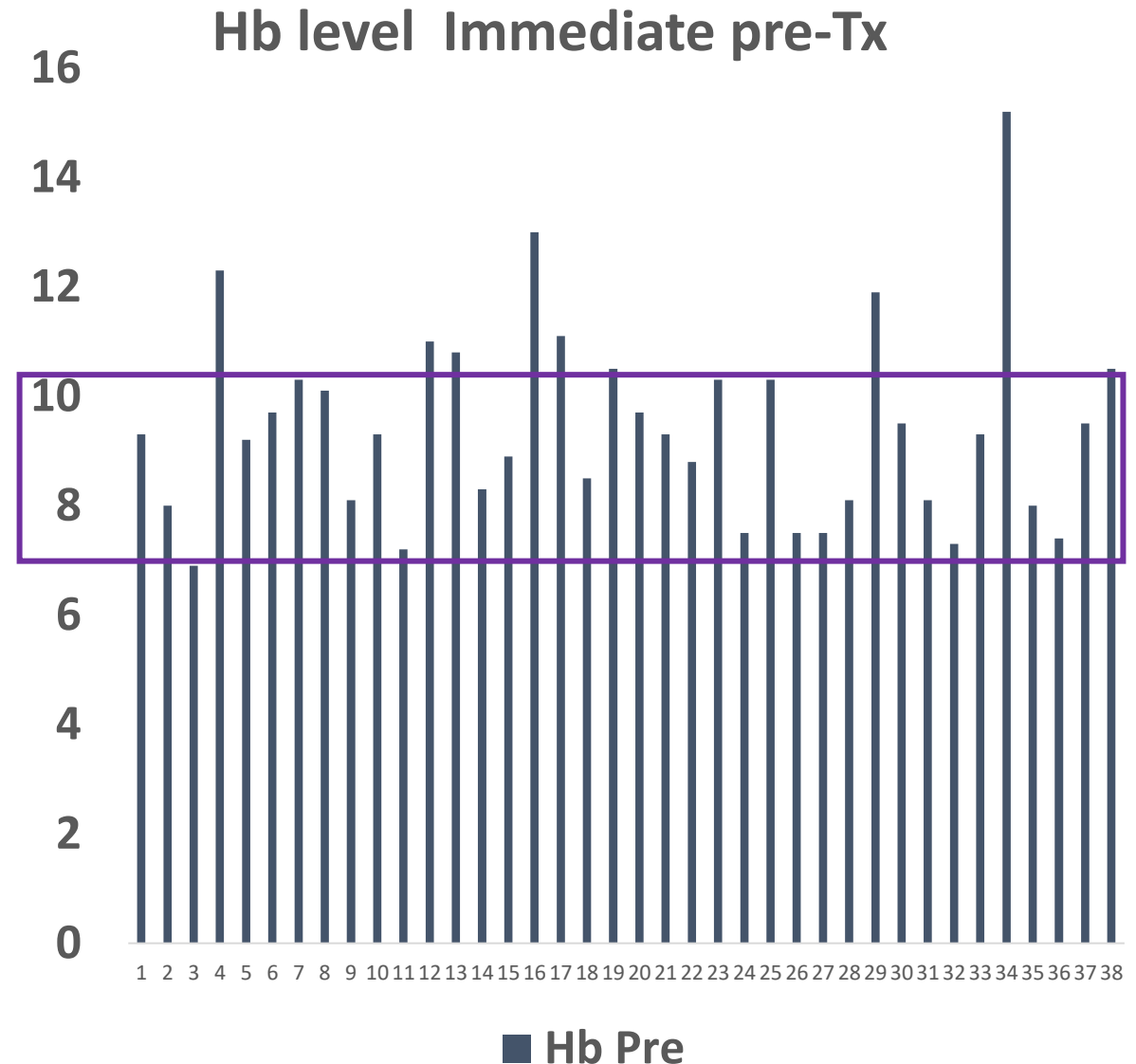
Last 2 years

38 Isolate Liver graft Transplants

10 PM donors (1 R/9L)
28 Living related
(= 37 Left split grafts)

19 had previous surgery
18 Biliary atresia
1 retx

3 had no portal hypertension
1 Abernethy
1 Glycogenosis
1 Crigler Najjar



Last 2 years

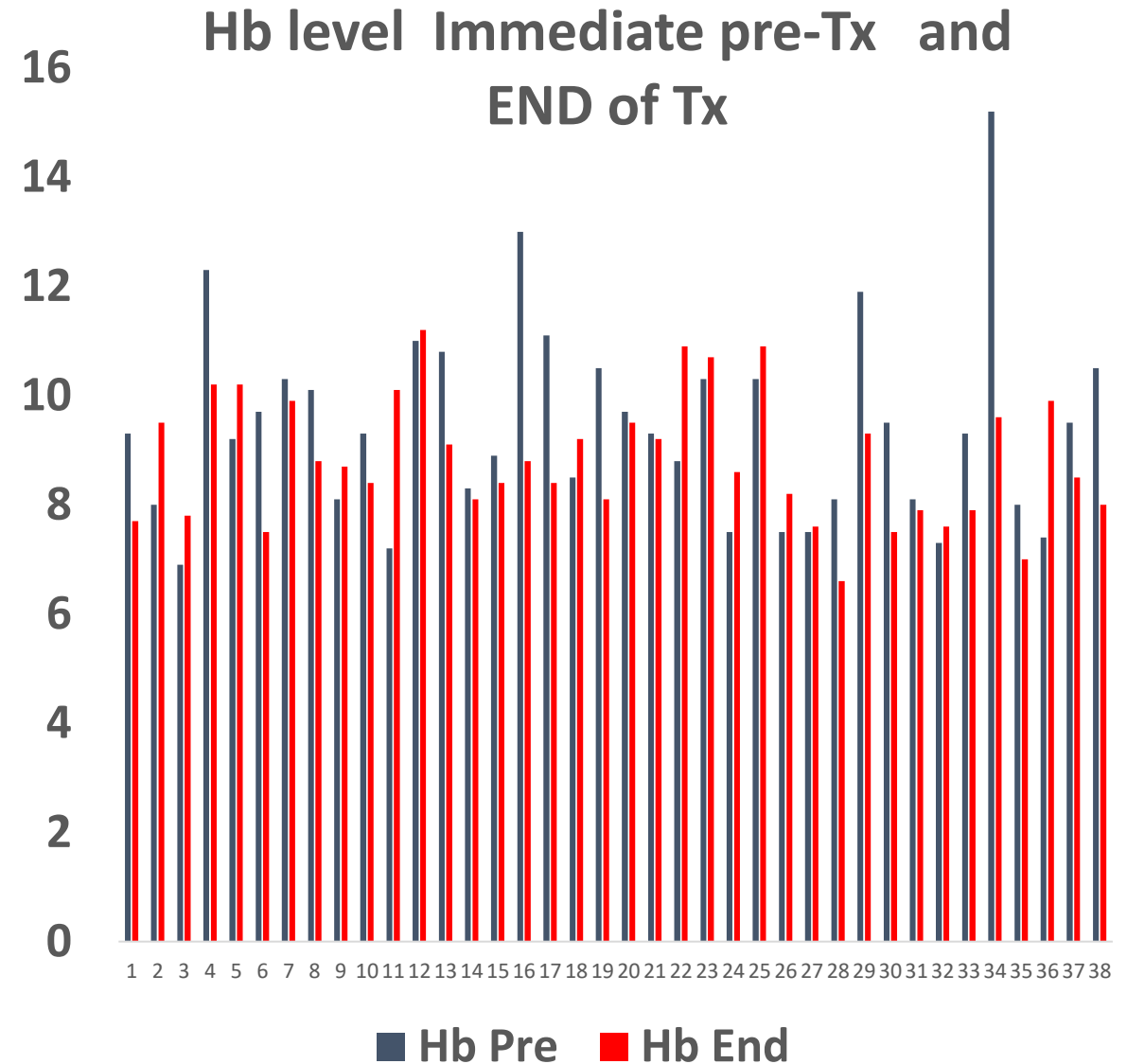
38 Isolate Liver graft Transplants

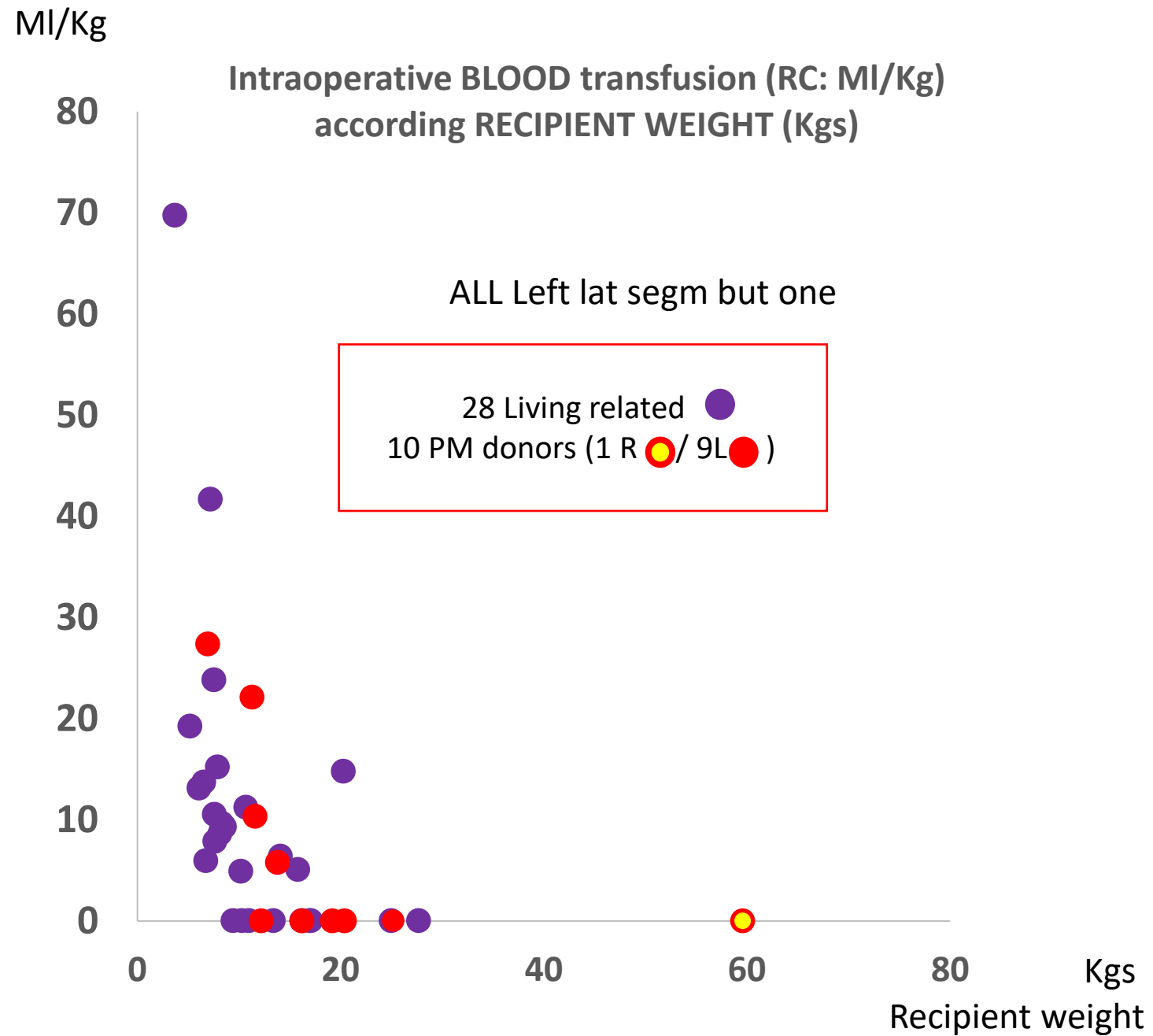
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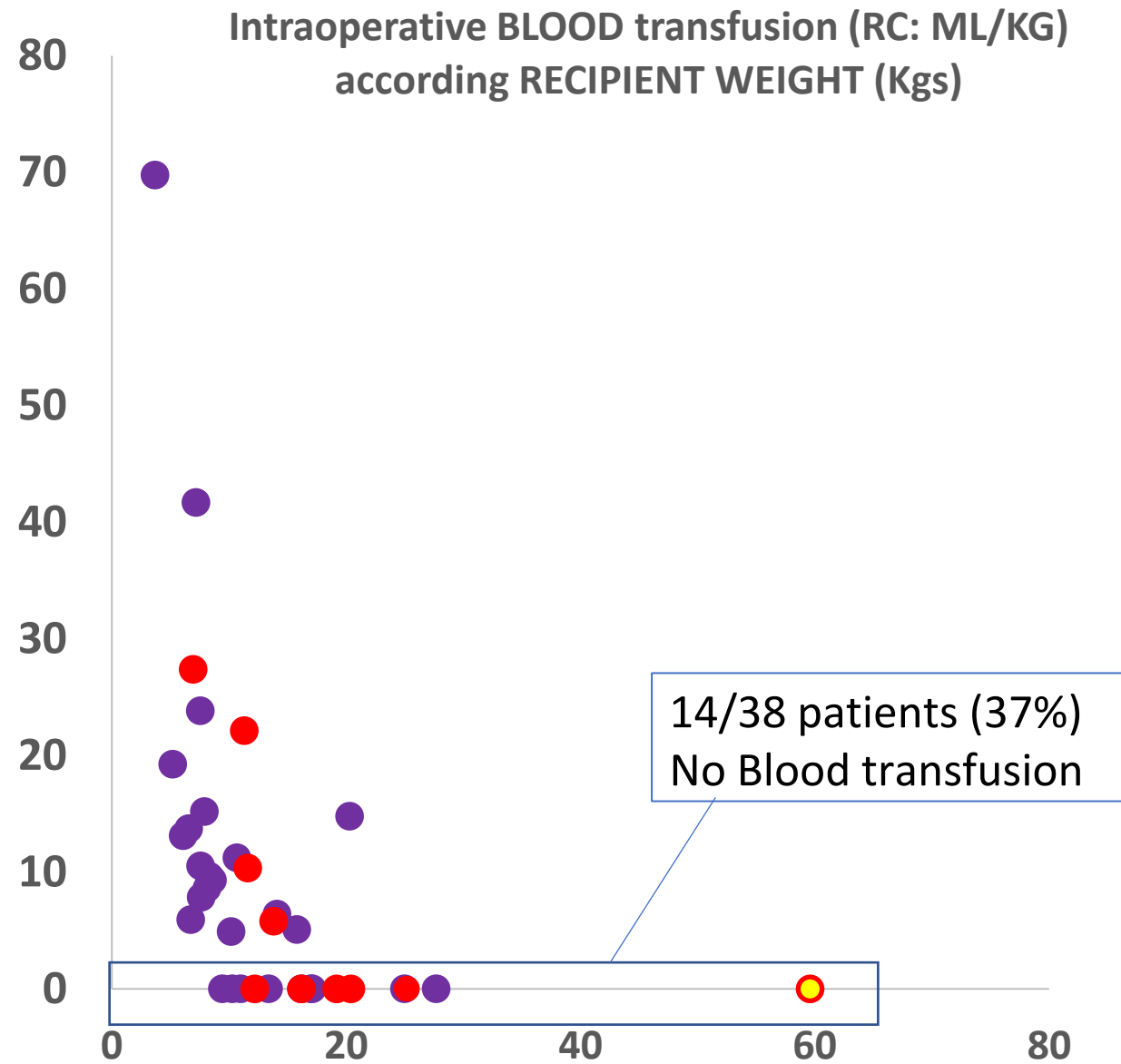
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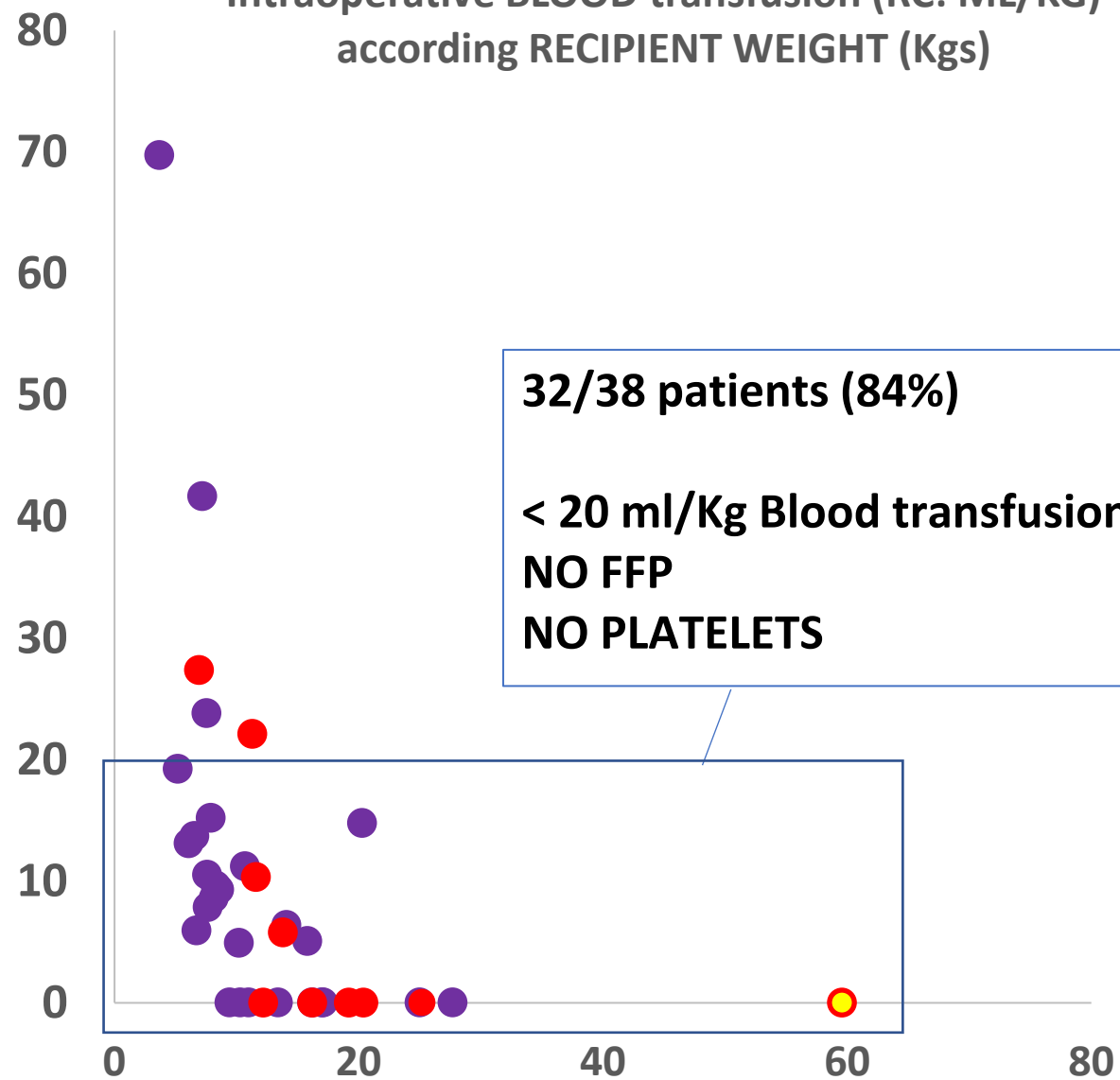
Median Age : 1.7 (0.1 to 15) Yrs
Median Weight: 10.9 (3.7 to 59) Kgs



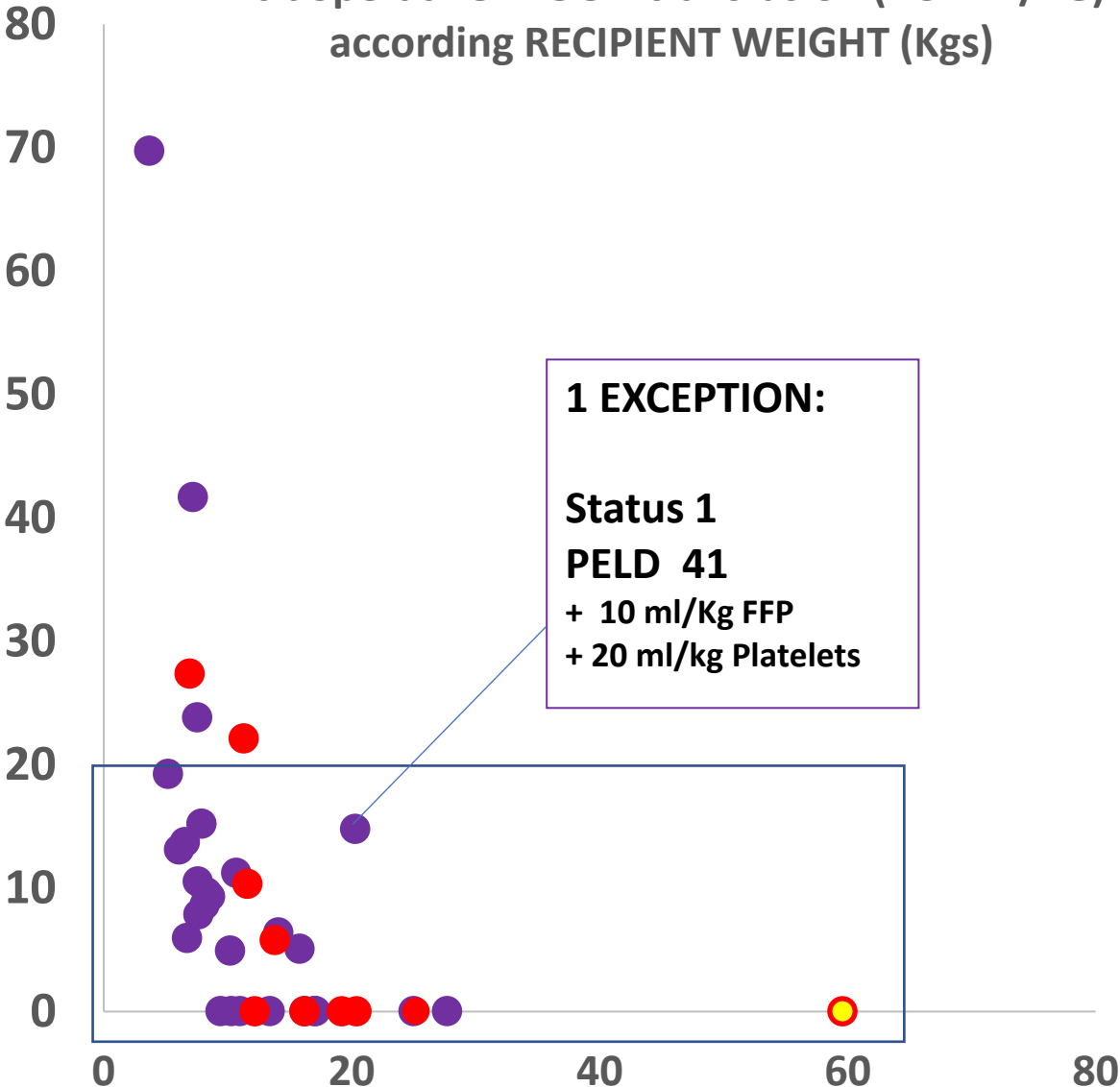




**Intraoperative BLOOD transfusion (RC: ML/KG)
according RECIPIENT WEIGHT (Kgs)**



Intraoperative BLOOD transfusion (RC: ML/KG)
according RECIPIENT WEIGHT (Kgs)



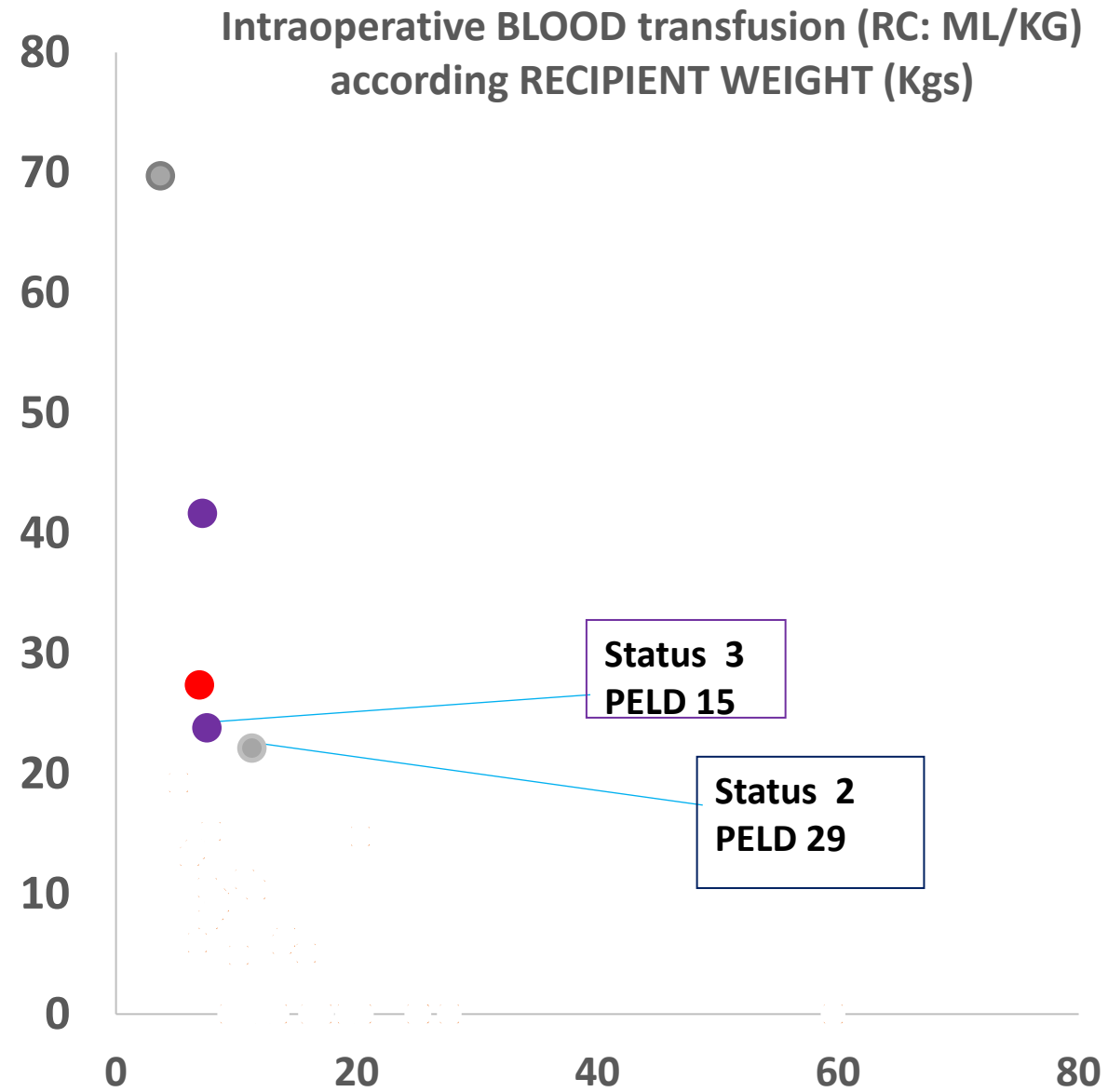
1 EXCEPTION:

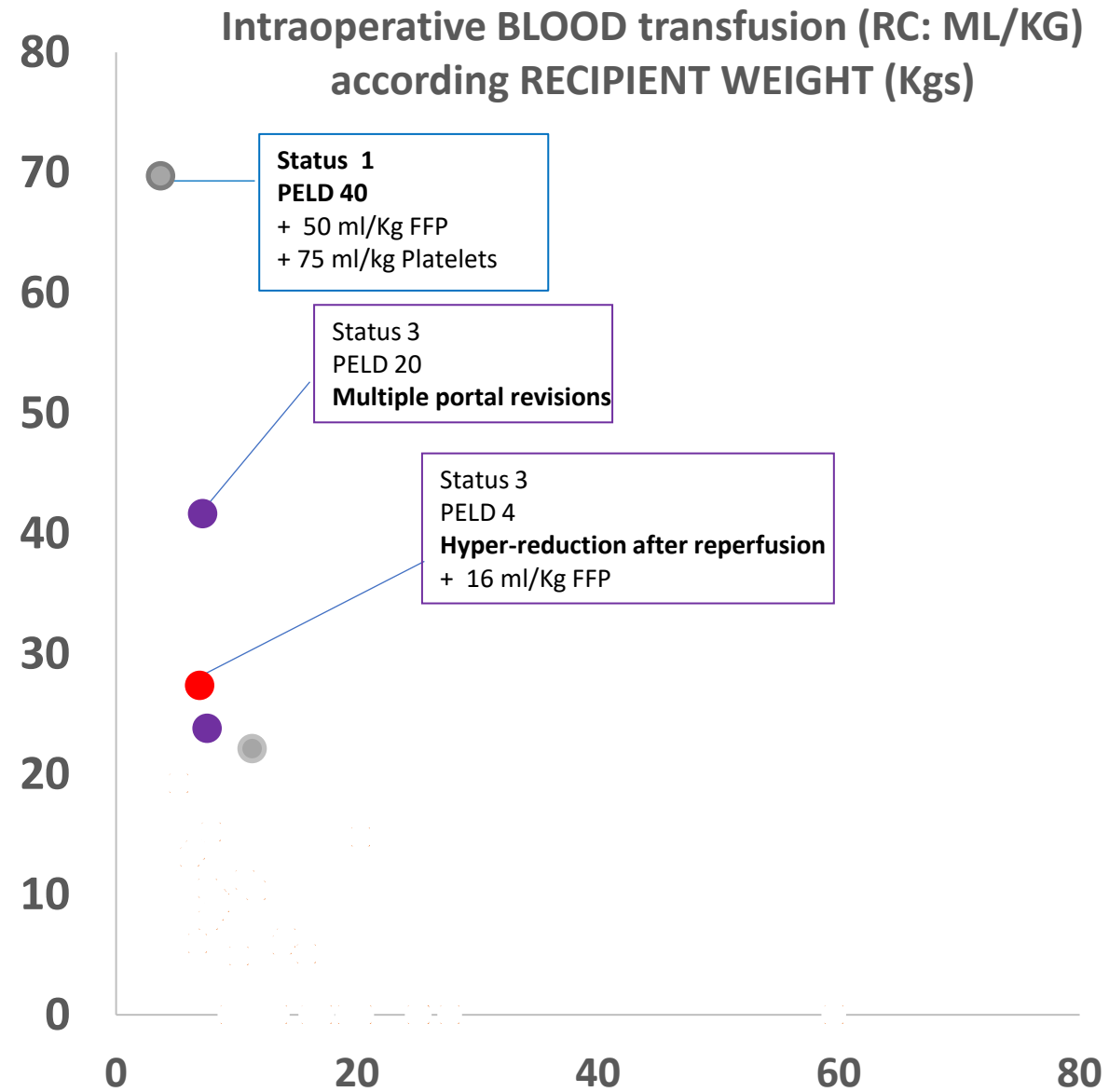
Status 1

PELD 41

+ 10 ml/Kg FFP

+ 20 ml/kg Platelets





Last 2 years

38 Isolate Liver graft Transplants

Extubation on Table

36/38 (95 %)

ICU stay

≤ 48 ore : 30/38 (79%)

Hospital stay

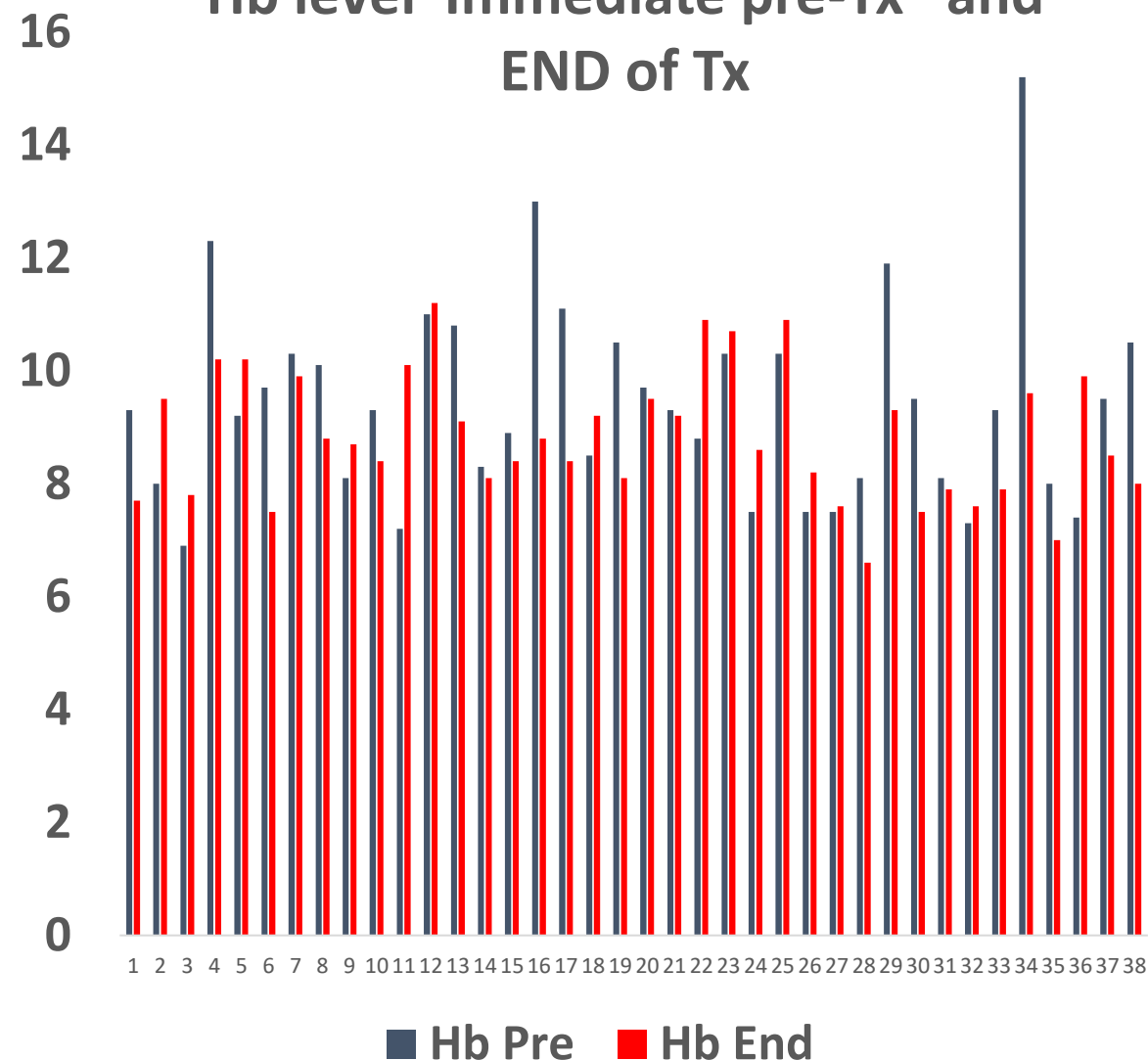
Median = 16 days
(9 to 49 days)

Actual graft and patient survival

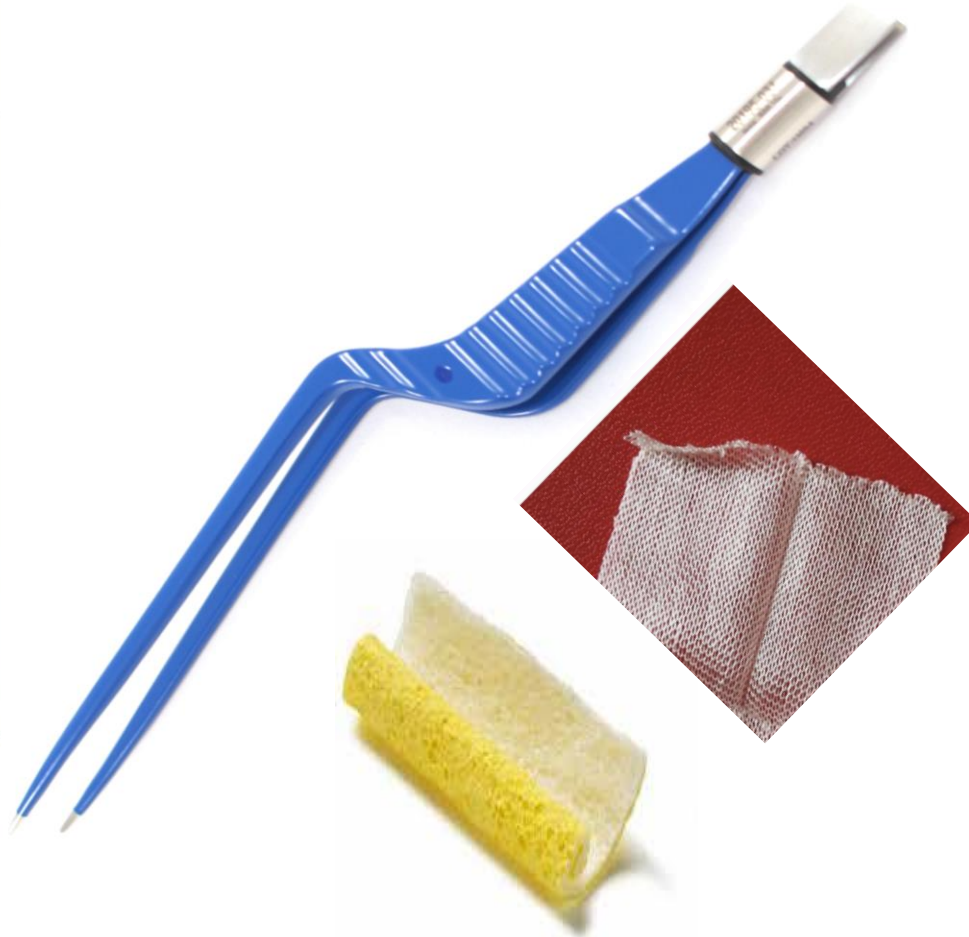
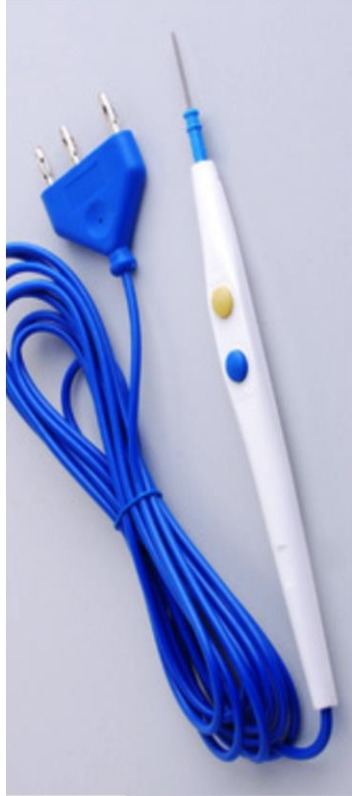
36/38
(2 disease recurrences)

No re-transplantation
No hospital stay mortality
No early vascular thrombosis
No Rejection episodes

Hb level Immediate pre-Tx and END of Tx



Surgical ToolKit

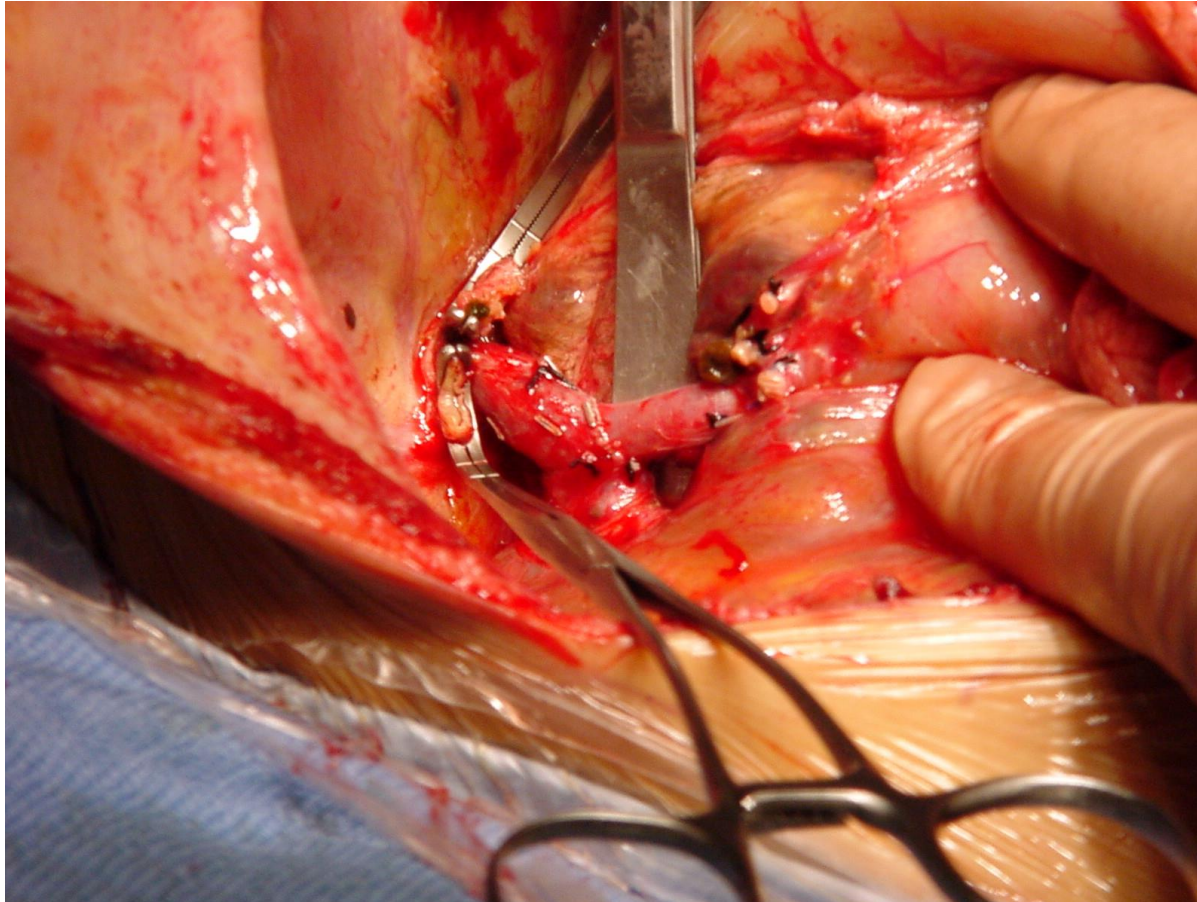


**Technical tips on
« getting out of trouble in theatre »**

5

A view on porto-caval shunts or venous bypass at transplant

Portocaval temporary shunt ? Veno-venous bypass ?

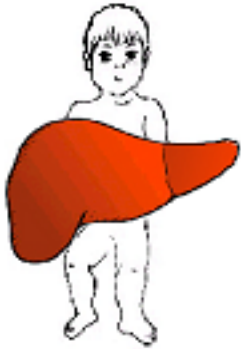


In last 15 years

1 portocaval temporary shunt

for attempting
a partial splenectomy
during anhepatic phase,
(patient with multiple
splenic artery aneurysms)

Technical tips on « getting out of trouble in theatre »

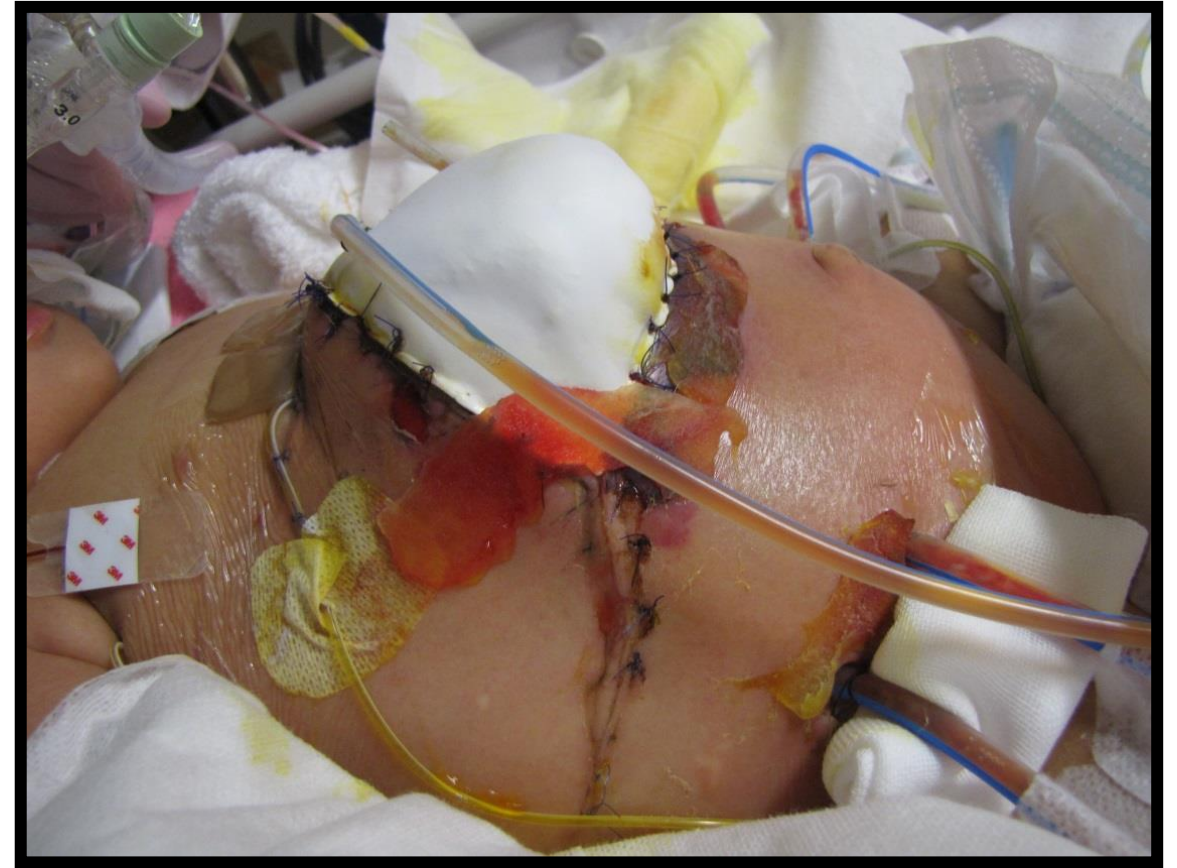


6

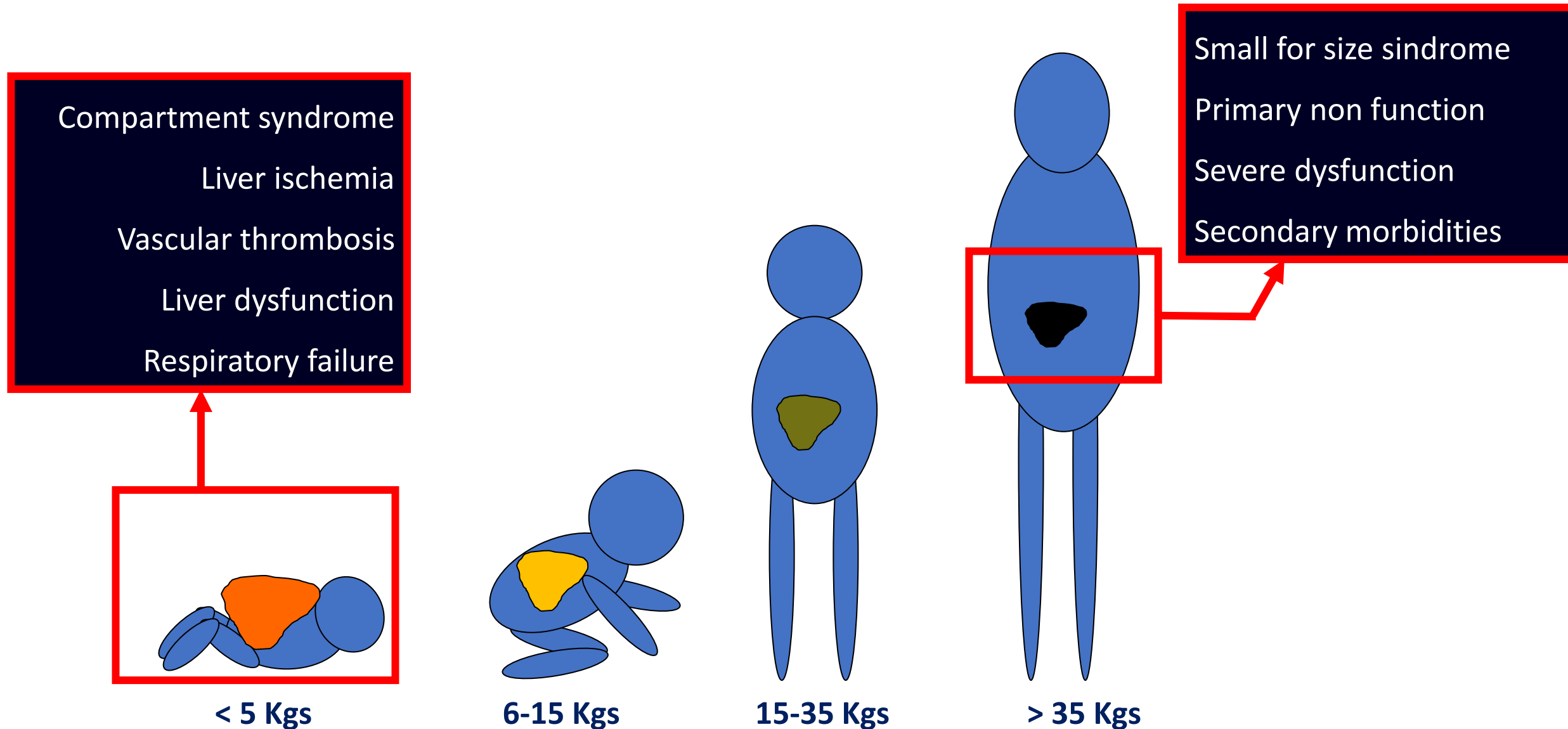
The « Size mismatch »

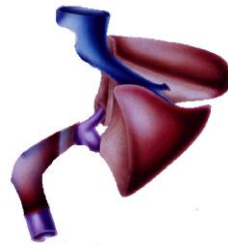
**graft size discrepancy with
the patient abdomen ...**

« Size mismatch » collaterals



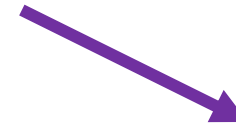
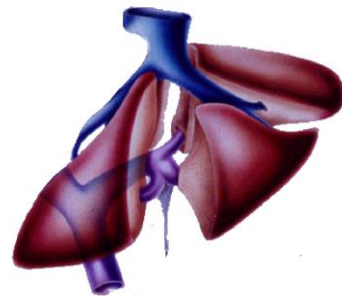
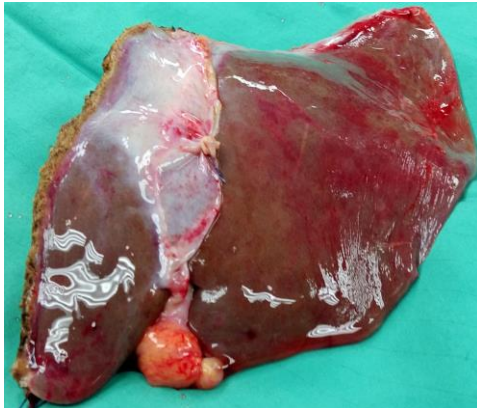
Using Left lateral segment grafts



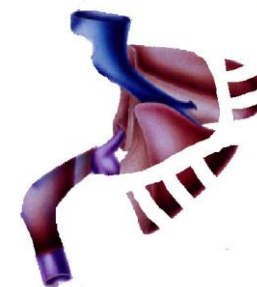


200-300 gr

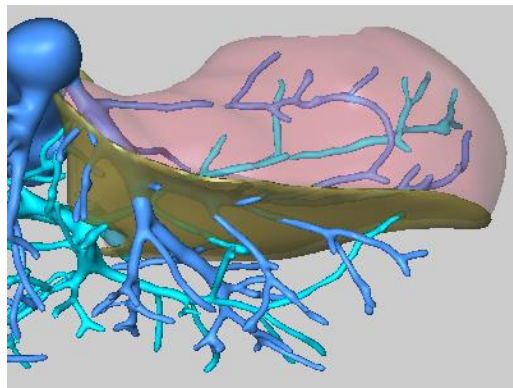
250-400 gr



80-200 gr



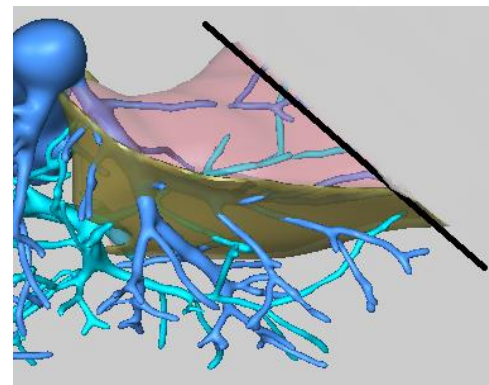
From 300 to 200 gr



« Reduced » LLS

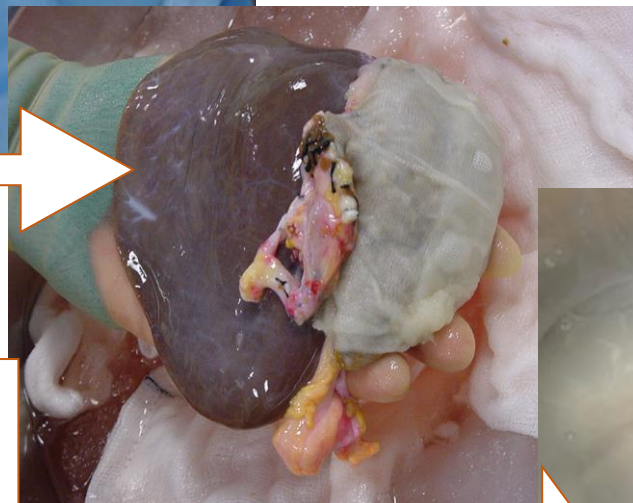


From 300 to 90 gr



« Hyper-Reduced » LLS





Thank You

**and
Good work**

