

XIV Semana Brasileira do Aparelho Digestivo



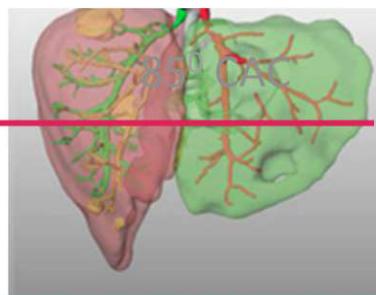
21 a 25 novembro | 2015 | ExpoCuritiba | Curitiba

## ALPPS

**Associating Liver Partition and Portal Vein Ligation for Staged Hepatectomy**

**Orlando Jorge M. Torres MD, PhD**

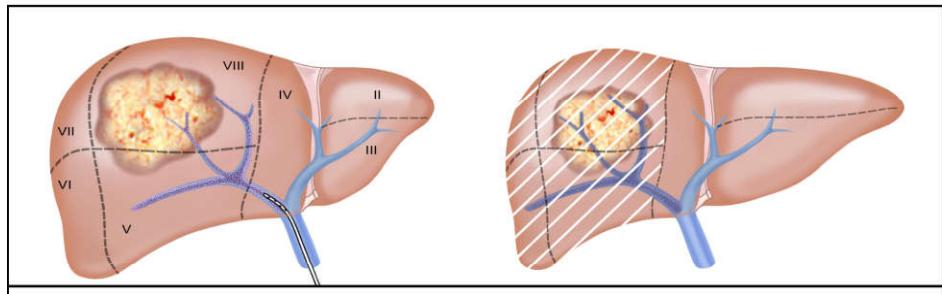
Professor Titular e Chefe do Serviço de  
Cirurgia do Aparelho Digestivo  
Universidade Federal do Maranhão - Brazil



# Indução de Hipertrofia

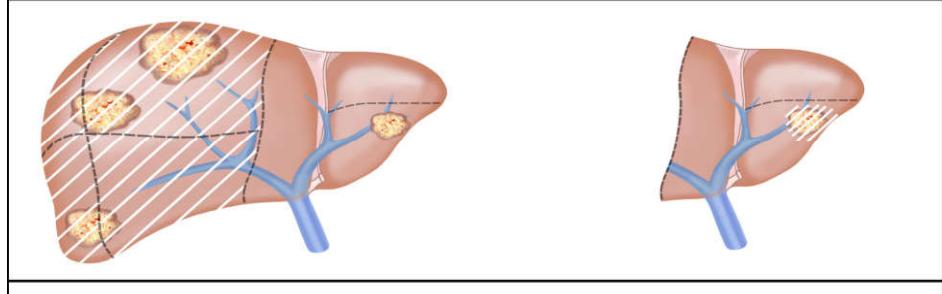
## Embolização Portal (EP)

*Makuuchi M, et al. Surgery 1990*



## Hepatectomia en 2 tempos

*Adam R, et al. Ann Surg. 2000*



## Hepatectomy

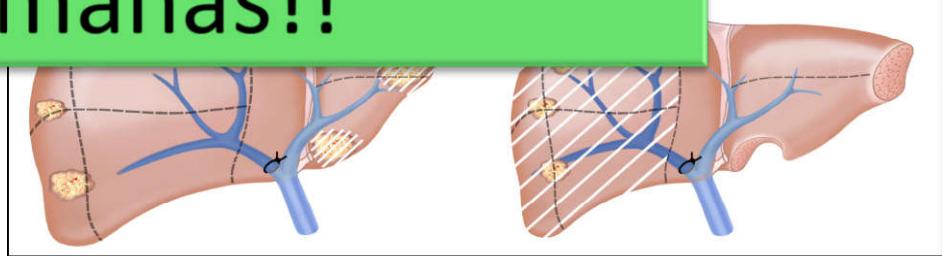
*Jaeck D, et al.*

**30-40% de hipertrofia  
6-8 semanas!!**

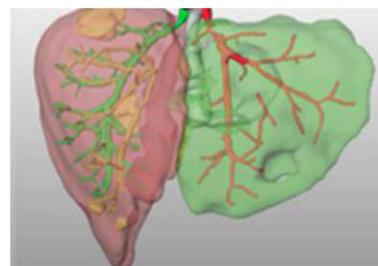


## Hepatectomia 2 tempos + LP

*J Belghiti, Clavien AP, et al. Hepatology 2008*



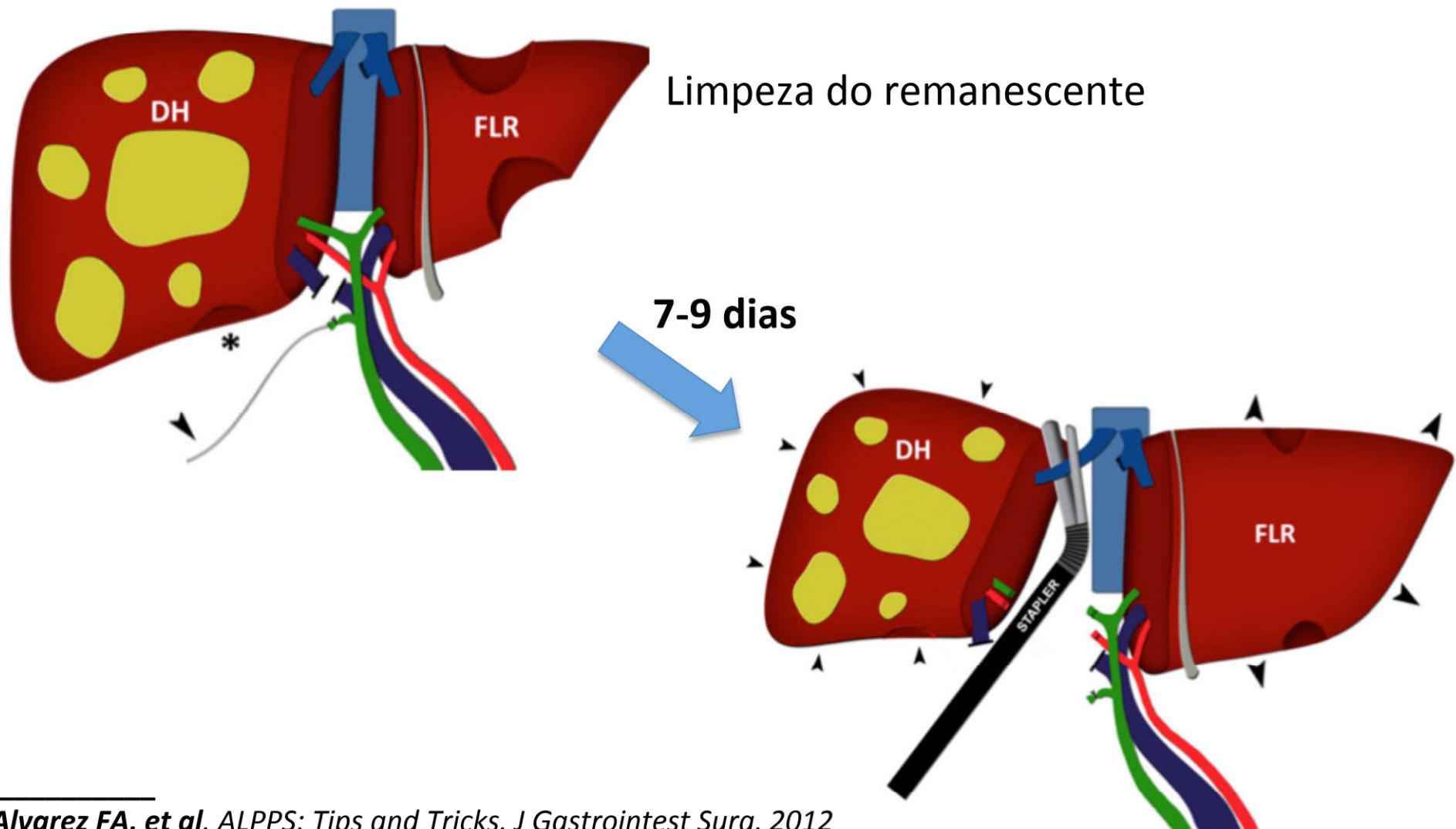
# O Começo



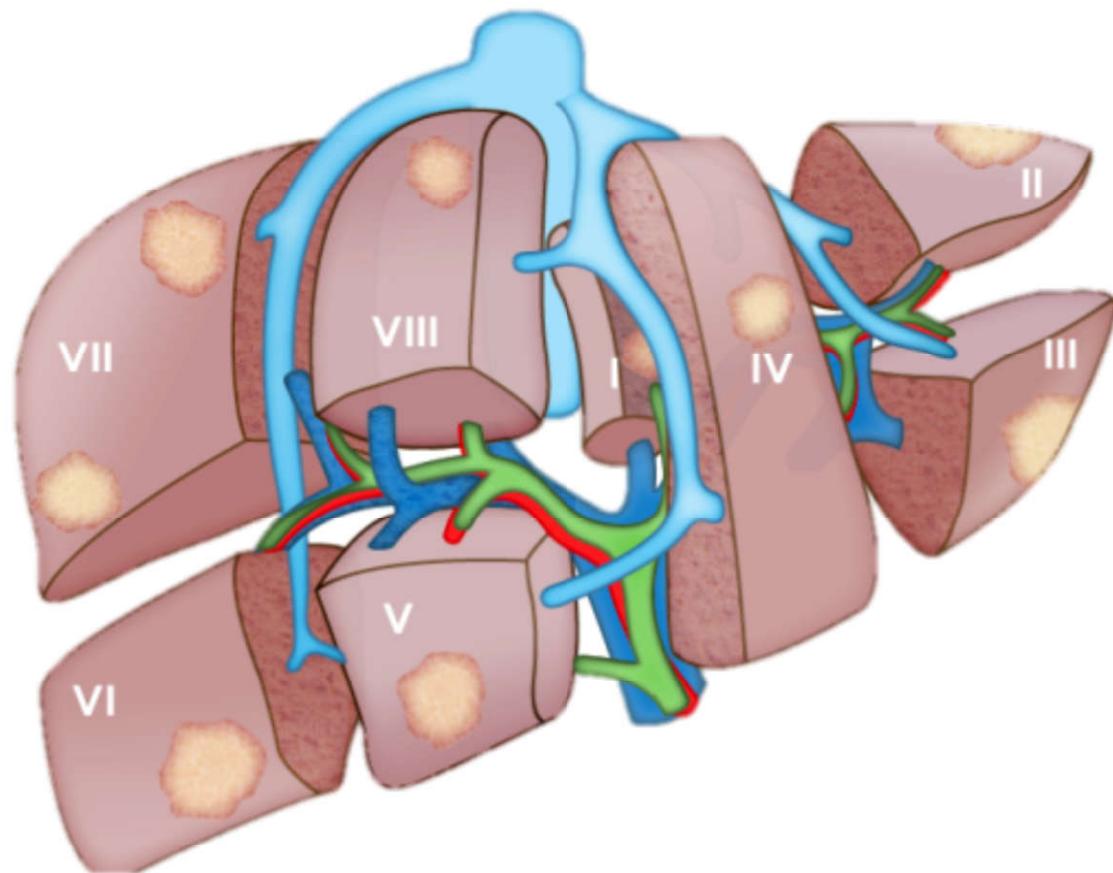
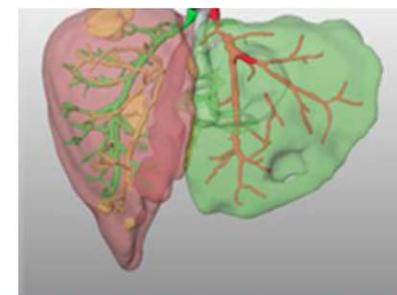
Hans Jurgen Schlitt  
Regensburg University  
Germany - 2007

# Aspectos técnicos

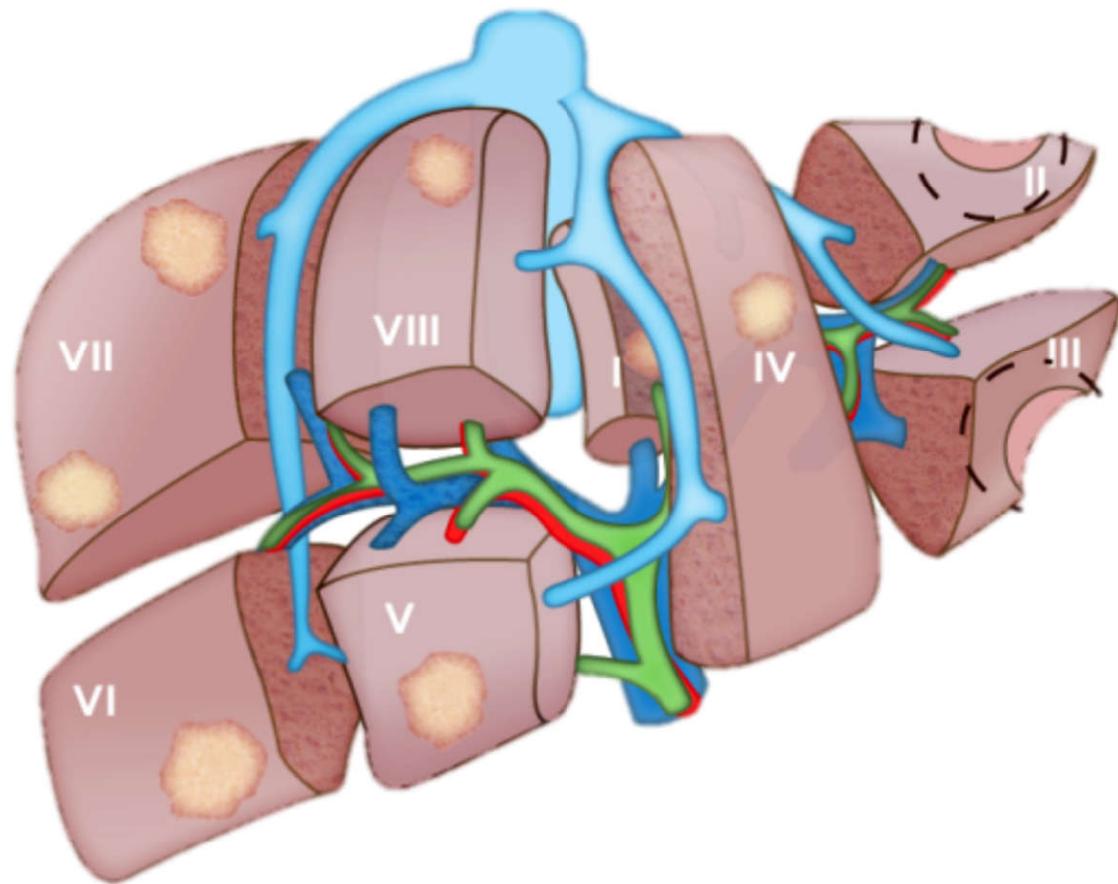
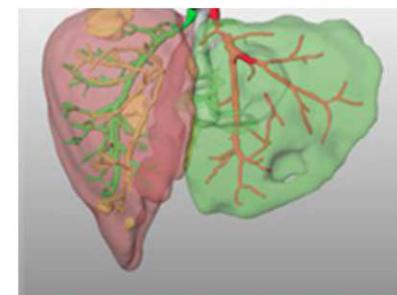
(hepatectomia em dois tempos com intervalo curto)



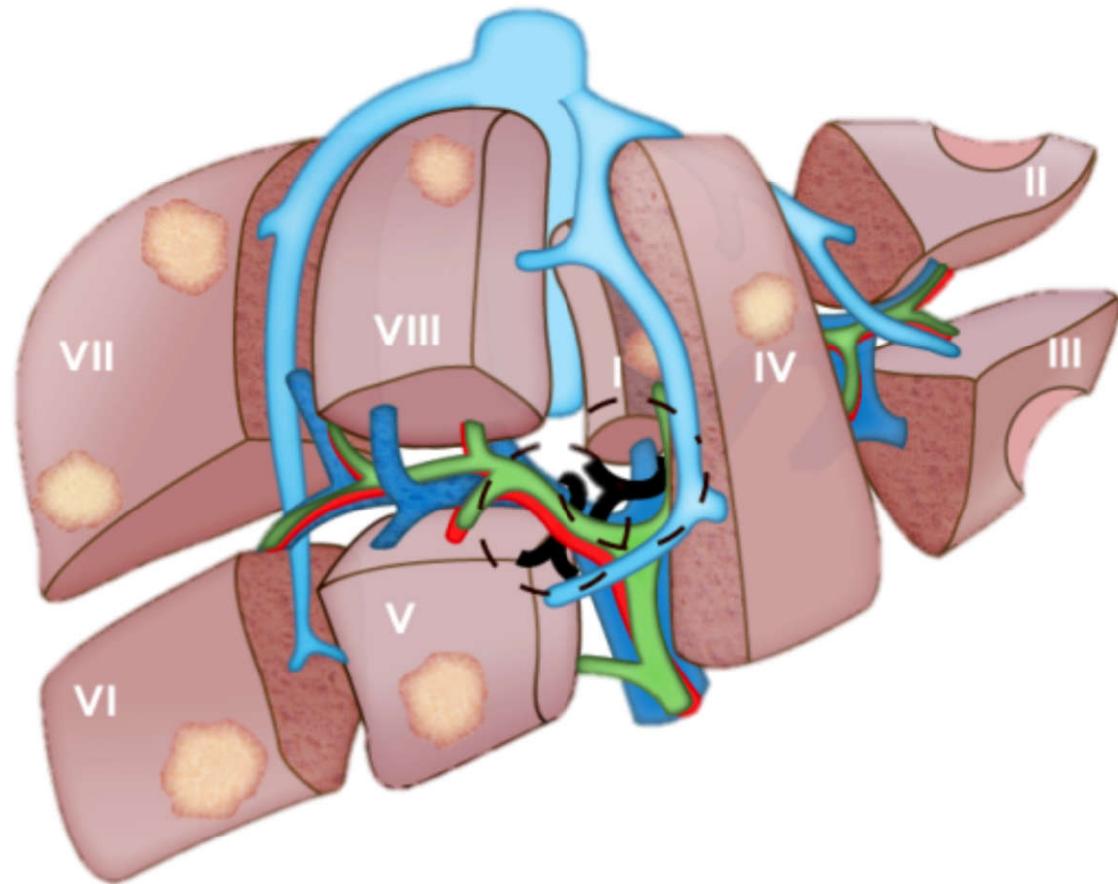
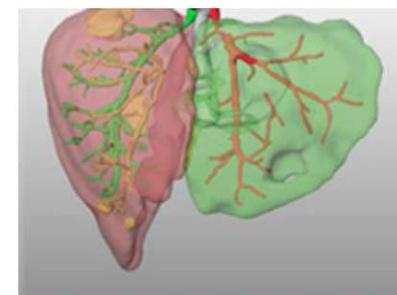
# ALPPS



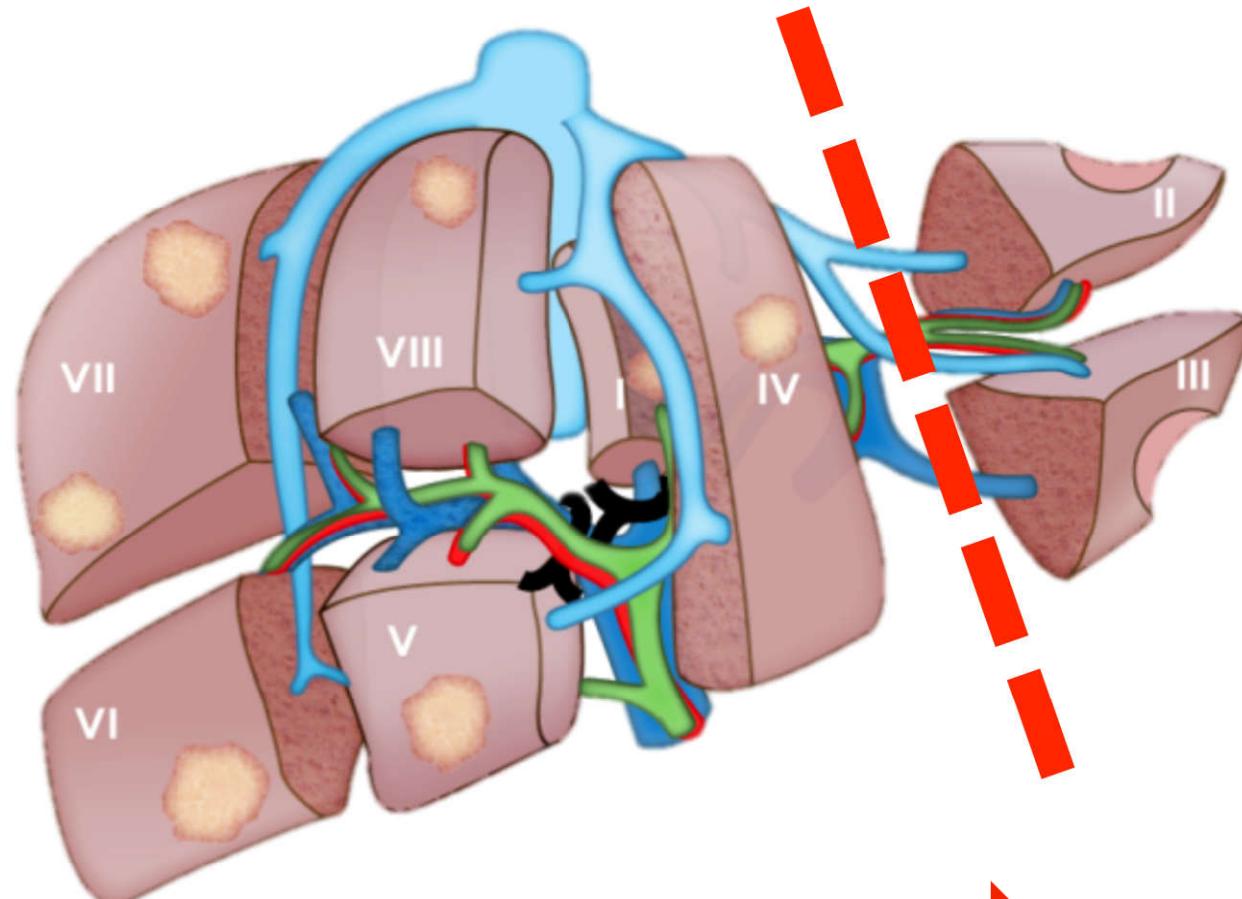
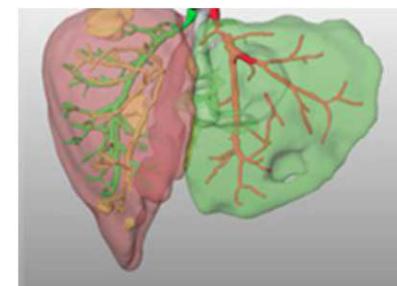
# ALPPS



# ALPPS

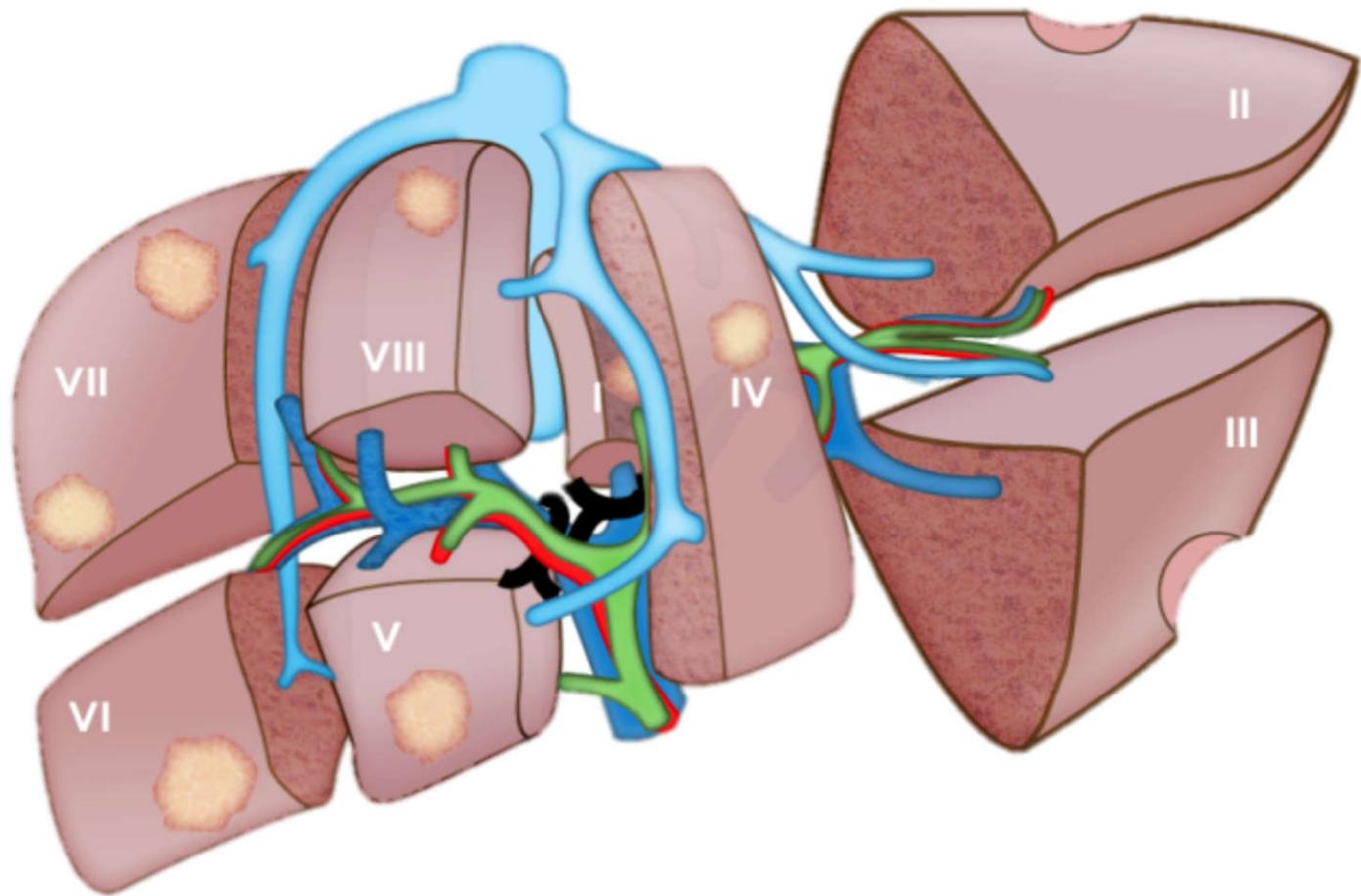
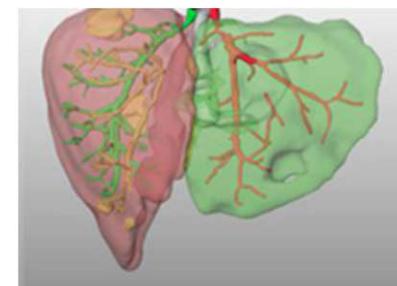


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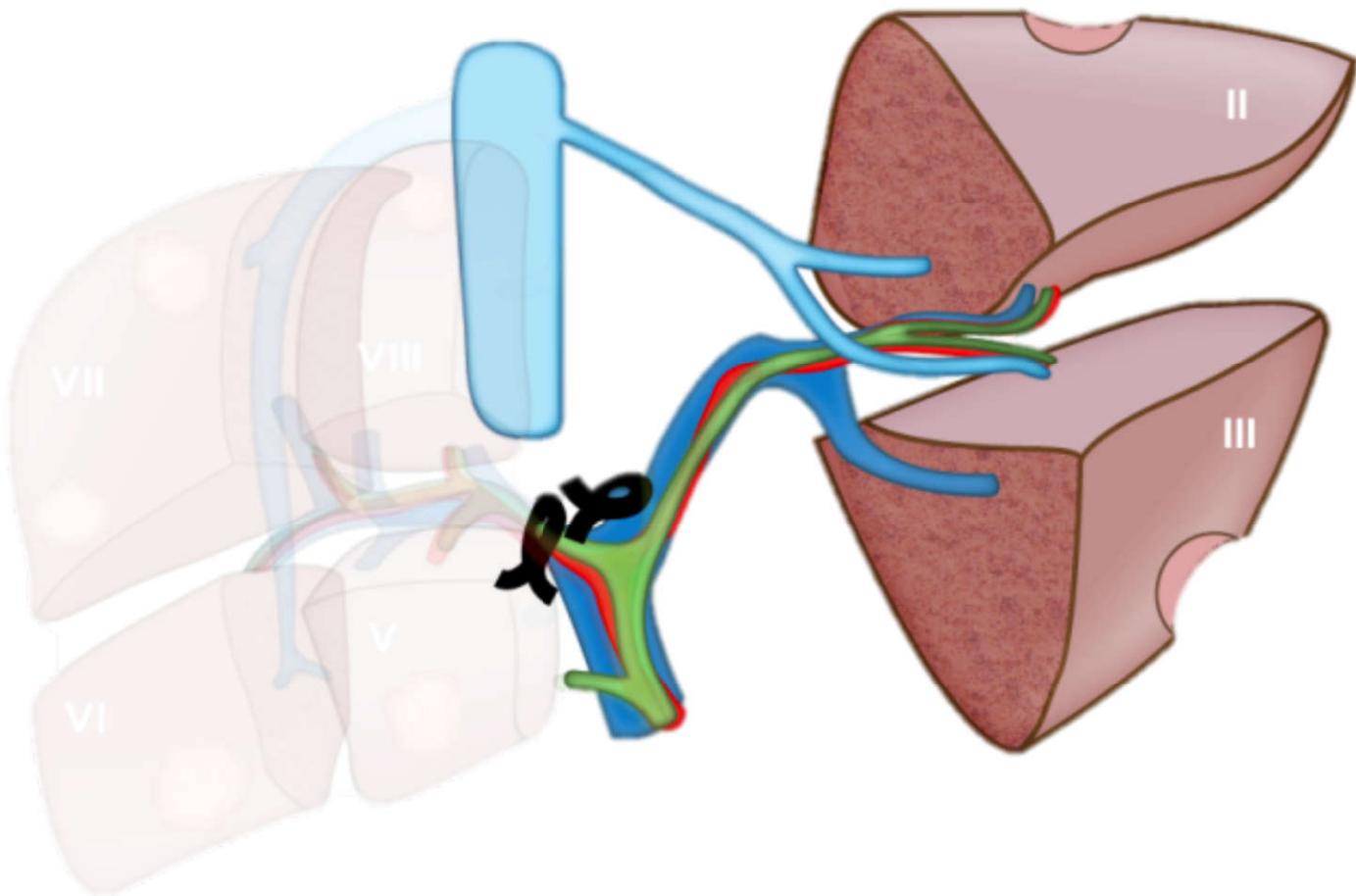
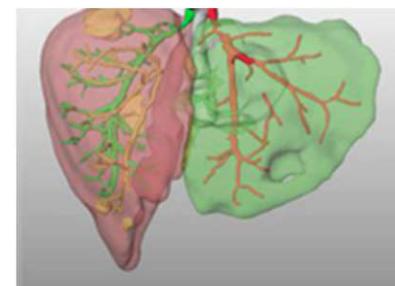


7 days

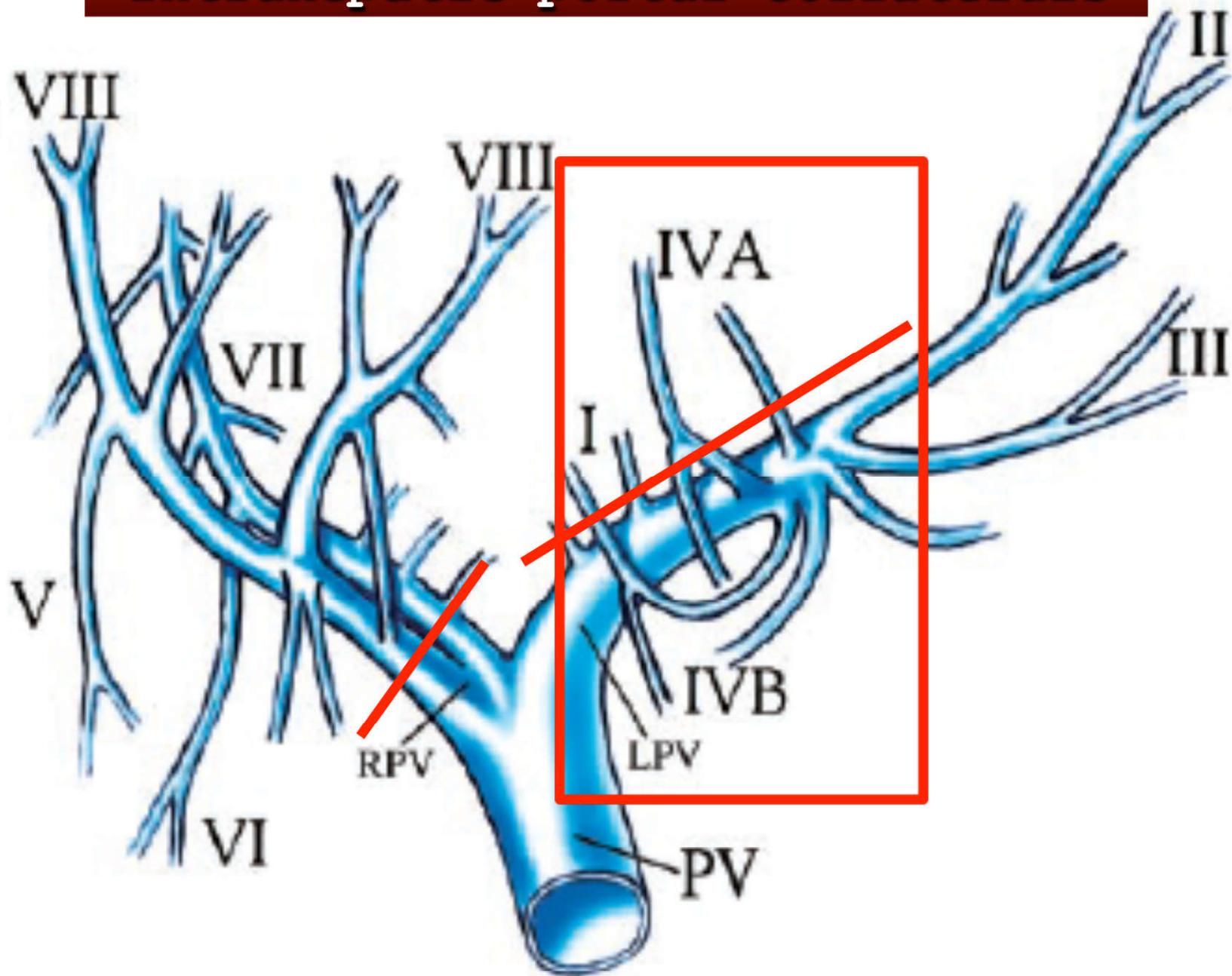
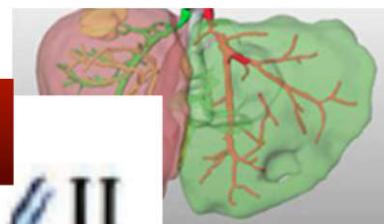
# ALPPS

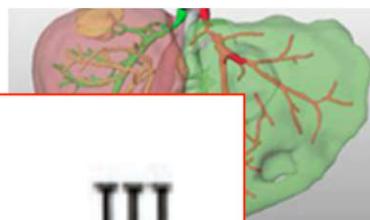
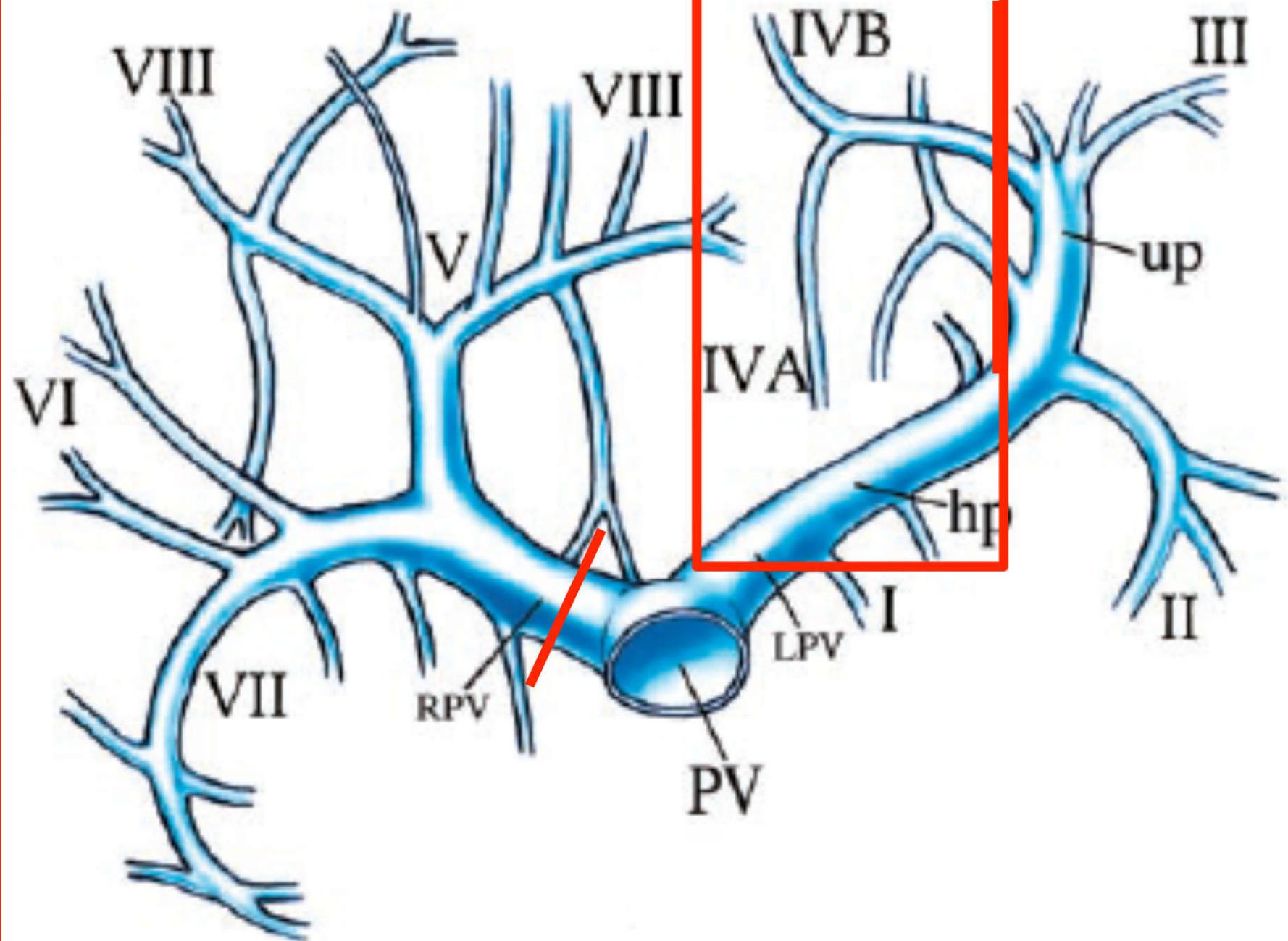


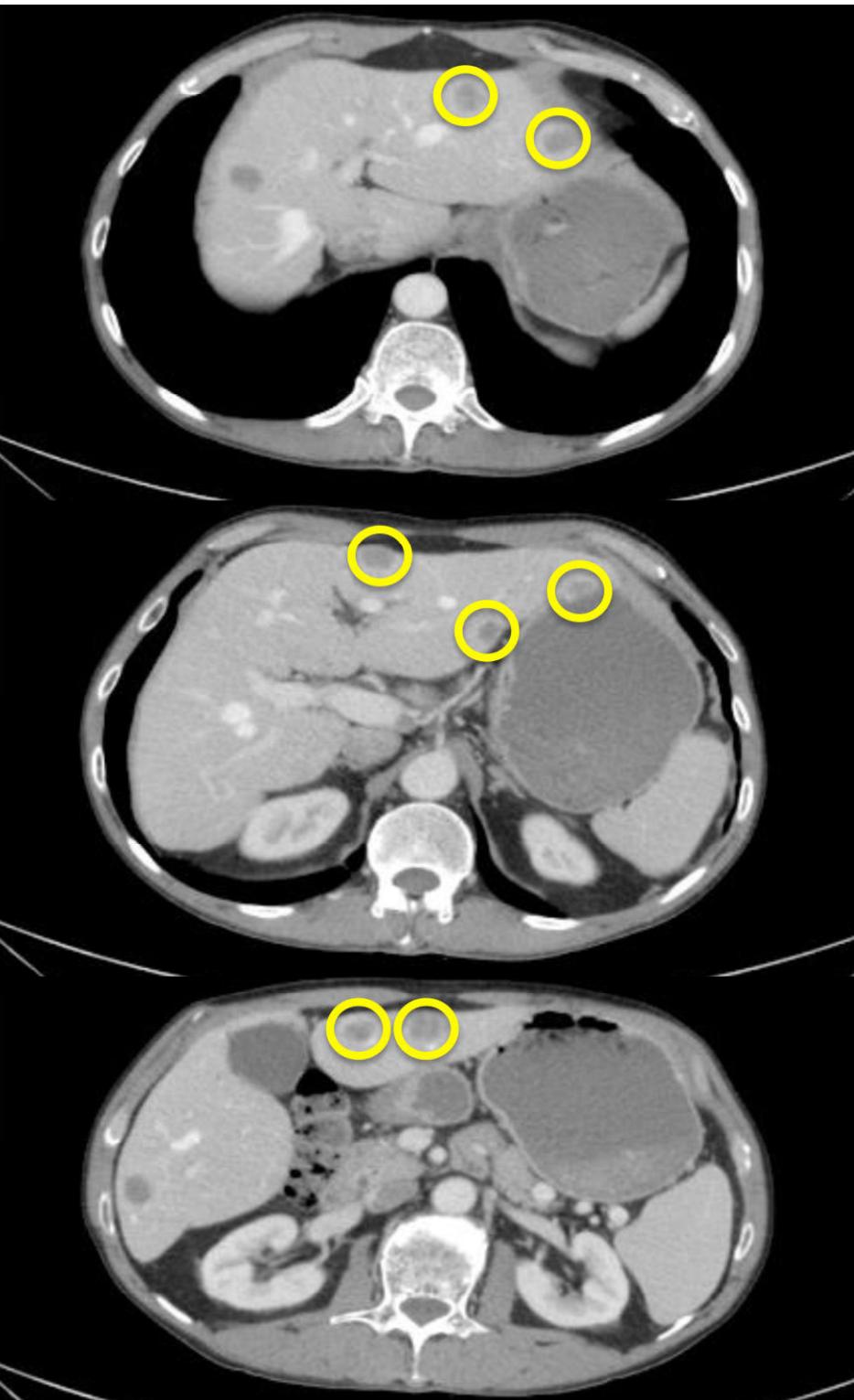
# ALPPS



## Intrahepatic portal collaterals





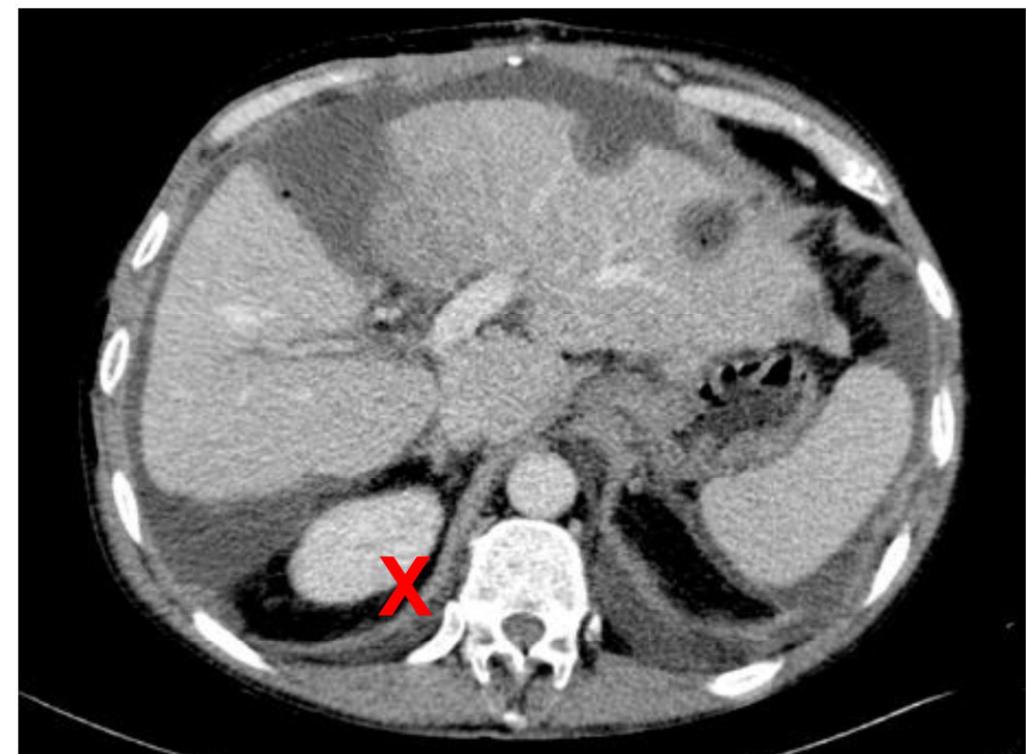


1º Tempo

Ressecção lesões à E

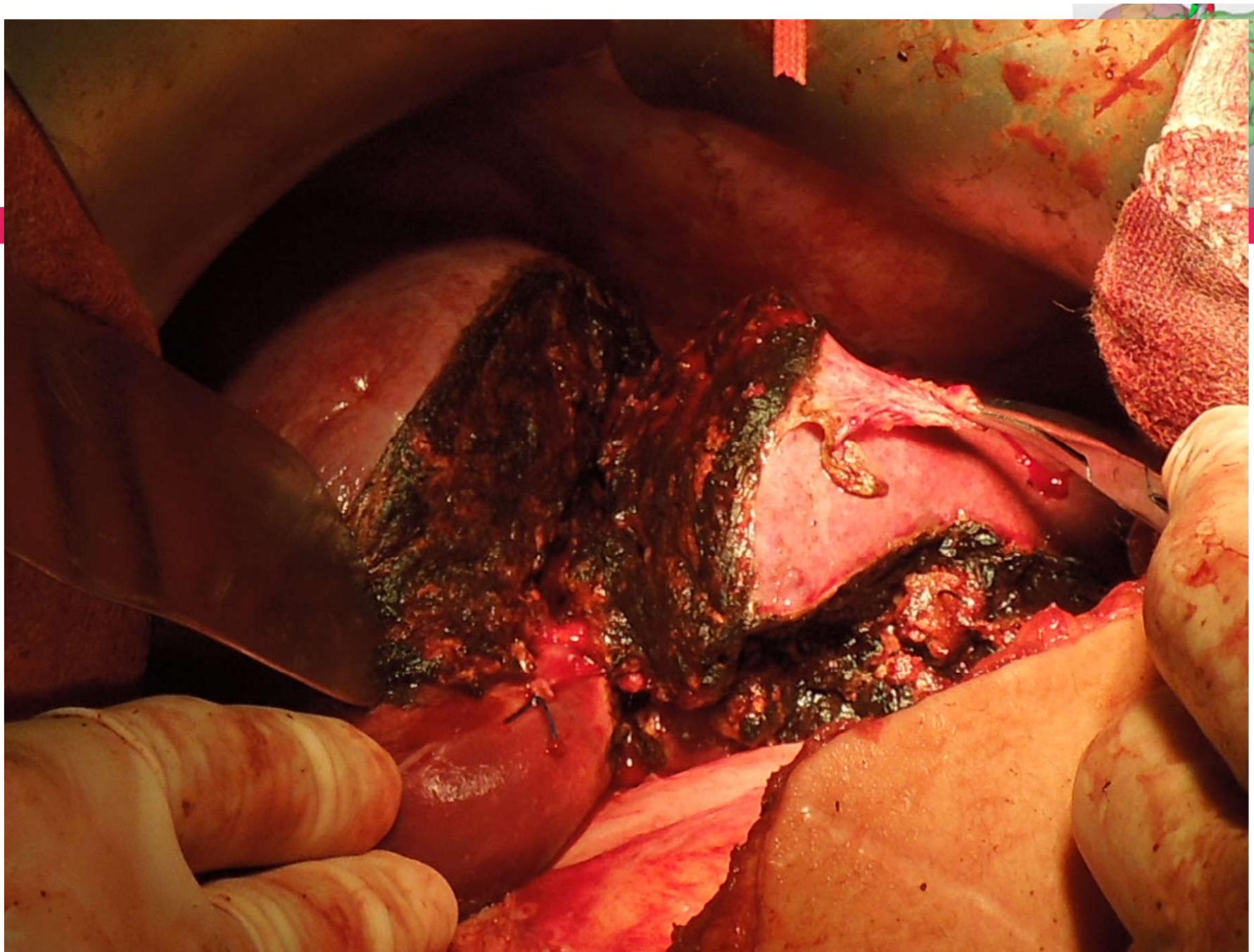
Ligadura da veia porta D

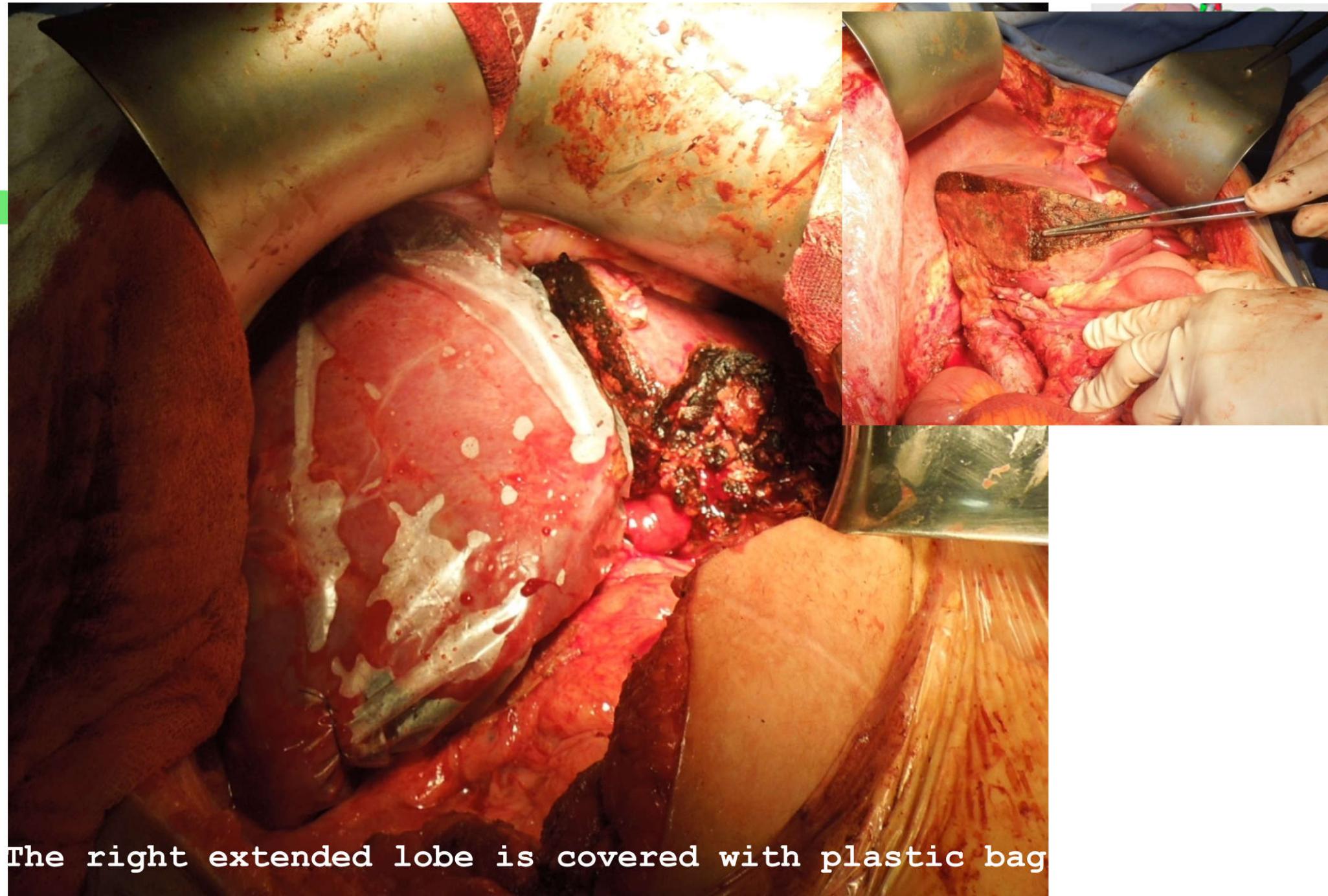
Transecção do parênquima



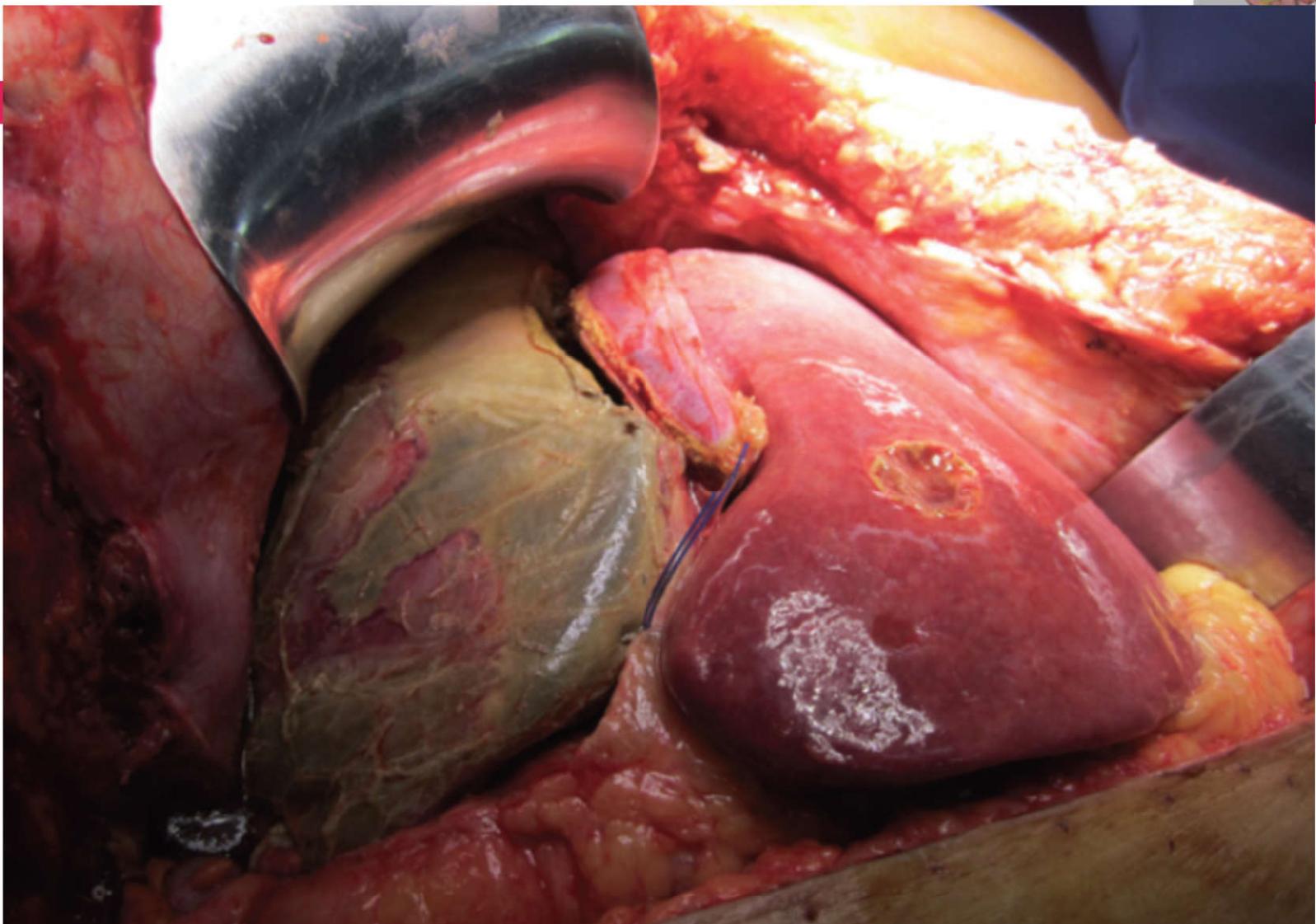
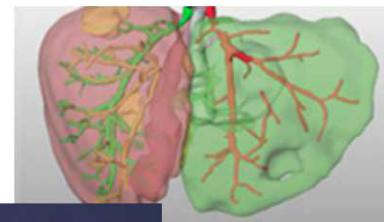
Serviço de Cirurgia do Fígado HC/FMUSP

\*Cortesia Prof. Paulo Herman

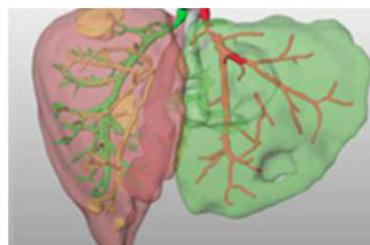




The right extended lobe is covered with plastic bag



Cortesia: Dr. Sanjay Govil (Bangalore – India)



# Right Portal Vein Ligation Combined With In Situ Splitting Induces Rapid Left Lateral Liver Lobe Hypertrophy Enabling 2-Staged Extended Right Hepatic Resection in Small-for-Size Settings

Andreas A. Schnitzbauer, MD,\* Sven A. Lang, MD,\* Holger Goessmann, MD,† Silvio Nadalin, MD,§

Janine Baumgart, MD,|| Stefan A. Farkas, MD,\* Stefan Fichtner-Feigl, MD,\* Thomas Lorf, MD,¶

Armin Goralcyk, MD,¶ Rüdiger Hörbelt, MD,# Alexander Kroemer, MD,\* Martin Loss, MD,\* Petra Rümmele, MD,‡

Marcus N. Scherer, MD,\* Winfried Padberg, MD,# Alfred Königsrainer, MD,§ Hauke Lang, MD,||

Aiman Obed, MD,¶ and Hans J. Schlitt, MD\*

ABCDDV/898

ABCD Arq Bras Cir Dig  
2013;26(1):40-43

Original Article

## ASSOCIATING LIVER PARTITION AND PORTAL VEIN LIGATION FOR STAGED HEPATECTOMY (ALPPS): THE BRAZILIAN EXPERIENCE

*Ligadura da veia porta associada à bipartição do fígado para hepatectomia em dois estágios (ALPPS): experiência Brasileira*

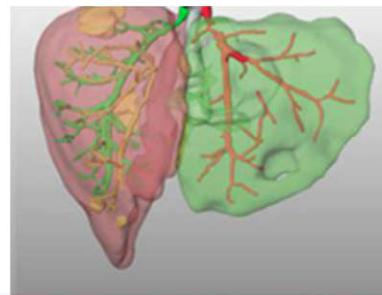
Orlando Jorge Martins TORRES<sup>1</sup>, Eduardo de Souza Martins FERNANDES<sup>2</sup> Cassio Virgilio Cavalcante OLIV

Cristiano Xavier LIMA<sup>4</sup>, Fabio Luiz WAECHTER<sup>5</sup>, Jose Maria Assunção MORAES-JUNIOR<sup>1</sup>,

Marcelo Moura LINHARES<sup>6</sup>, Rinaldo Danese PINTO<sup>7</sup>, Paulo HERMAN<sup>8</sup>, Marcel Autran Cesar MACHAD

59 e 64% Complicação  
12 e 12,8% Mortalidade





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## EDITORIAL

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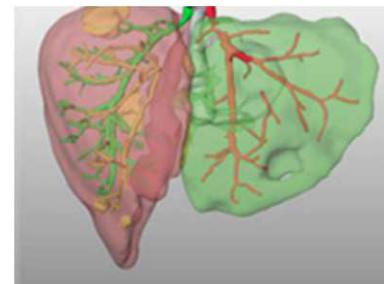
# Playing Play-Doh to Prevent Postoperative Liver Failure

## *The “ALPPS” approach*

*Eduardo de Santibañes, MD, PhD,\* and Pierre-Alain Clavien, MD, PhD†*

The safe removal of extensive tumor load in the liver has been one of the main focuses of laboratory and clinical research for hepato-biliary surgeons over the past 3 decades.<sup>1</sup> The first breakthrough is credited to Masatoshi Makuuchi, who in 1980s, introduced the concept of the portal vein embolization (PVE) of the right portal branch to induce hypertrophy of the left side of the liver, enabling a safer removal of large or multiple tumors, mostly located in the right hemiliver and segment IV<sup>2</sup>. This technique was rapidly adopted by many to prevent liver failure after a variety of extensive

**ALPPS**



ORIGINAL ARTICLE

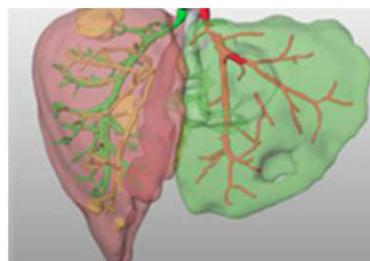
# Associating Liver Partition and Portal Vein Ligation for Staged Hepatectomy Offers High Oncological Feasibility With Adequate Patient Safety

*A Prospective Study at a Single Center*

Fernando A. Alvarez, MD, Victoria Ardiles, MD, Martin de Santibañes, MD, Juan Pekolj, MD, PhD,  
and Eduardo de Santibañes, MD, PhD

53% Morbidade  
6,6% Mortalidade

# ALPPS Registry



PAPER OF THE 21ST ANNUAL ESA MEETING

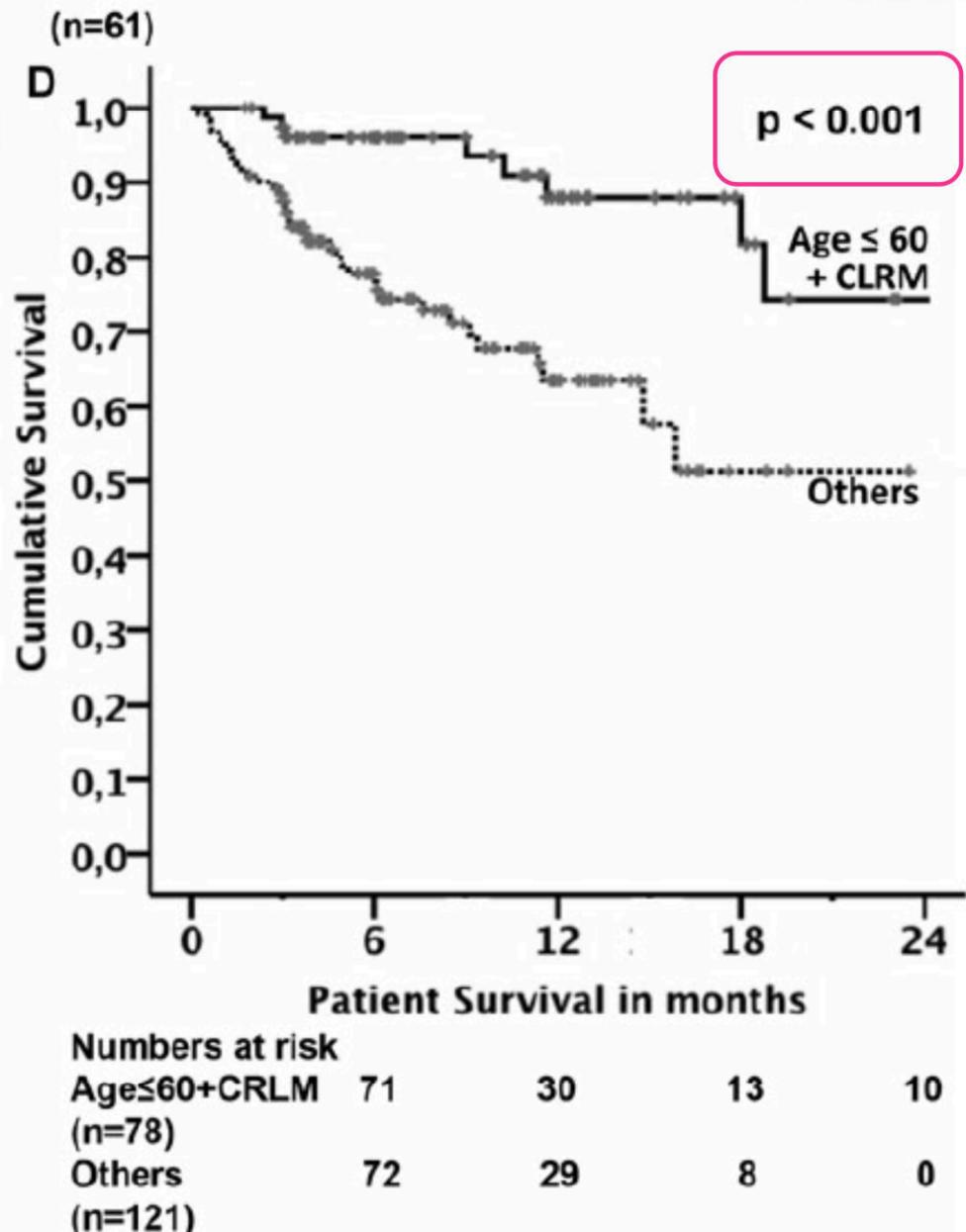
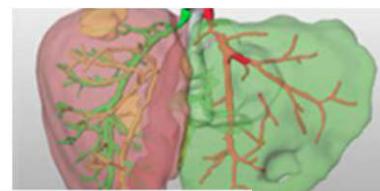
## Early Survival and Safety of ALPPS

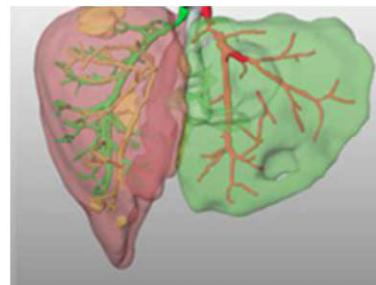
*First Report of the International ALPPS Registry*

Erik Schadde, MD, FACS,\* Victoria Ardiles, MD,† Ricardo Robles-Campos, MD,‡ Massimo Malago, MD, FACS,§  
Marcel Machado, MD,¶ Roberto Hernandez-Alejandro, MD,|| Olivier Soubreane, MD,\*\*  
Andreas A. Schnitzbauer, MD,†† Dimitri Raptis, MD,\* Christoph Tschuor, MD,\* Henrik Petrowsky, MD, FACS,\*  
Eduardo De Santibanes, MD, PhD, FACS,† and Pierre-Alain Clavien, MD, PhD, FACS\*§§; On behalf of the ALPPS  
Registry Group

40 % Morbidade  
9 % Mortalidade

# ALPPS Registry

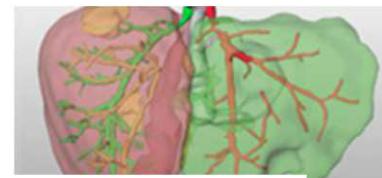




# Can we improve the morbidity and mortality associated with the associating liver partition with portal vein ligation for staged hepatectomy (ALPPS) procedure in the management of colorectal liver metastases?

Roberto Hernandez-Alejandro, MD,<sup>a</sup> Kimberly A. Bertens, MD, MPH,<sup>a</sup> Karen Pineda-Solis, MD,<sup>a</sup> and Kristopher P. Croome, MD, MS,<sup>a,b</sup> London, Ontario, Canada, and Rochester, MN

36 % Morbidade  
0 % Mortalidade



ABCDDV/1112

ABCD Arq Bras Cir Dig  
2015;28(3):155-156  
DOI: /10.1590/S0102-67202015000300001

Editorial

## ALPPS: PAST, PRESENT AND FUTURE

*ALPPS: passado, presente e futuro*

Orlando Jorge M TORRES<sup>1</sup>, Eduardo S M FERNANDES<sup>2</sup>, Paulo HERMAN<sup>3</sup>

<sup>1</sup>Universidade Federal do Maranhão (Federal University of Maranhão), São Luís, MA; <sup>2</sup> Hospital Adventista Silvestre, Rio de Janeiro, RJ, Brazil;

<sup>3</sup>Universidade de São Paulo (University of São Paulo), São Paulo, SP, Brazil.

Complete tumor resection in the liver is the only chance to obtain long-term survival in patients with hepatic tumor or metastasis from other primary cancers. In patients with a large load of tumor within the liver, multiple strategies have been employed to improve resection, especially when a small liver remnant is expected. Staged hepatectomies, in which the surgeon perform partial resection in one side of the liver, and after four to six weeks proceed with the resection of the other side, and strategies to induce hypertrophy of the future liver remnant that include percutaneous portal vein embolization or intraoperative portal vein ligation, have also been largely employed by specialized liver surgery teams.

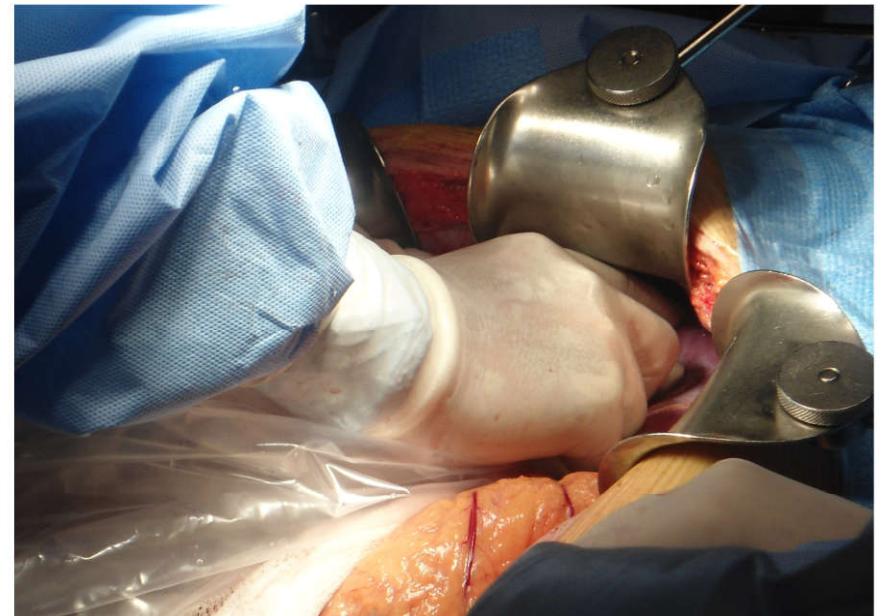
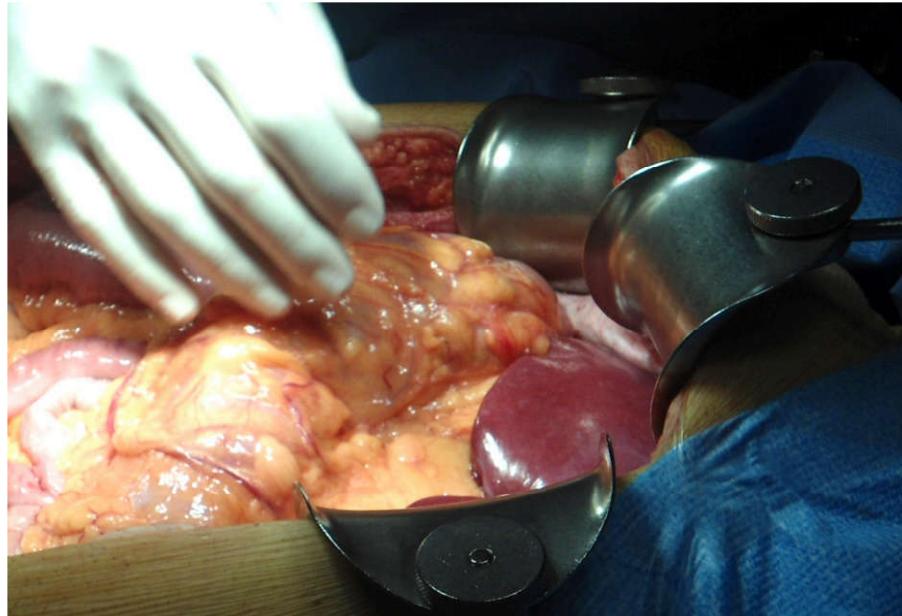
Hans Schlitt from Regensburg, Germany developed a new procedure, called liver bi-partition, for the first time by chance, in 2007. Planning to perform an extended right hepatectomy in a patient with hilar cholangiocarcinoma - being the future cholestatic liver remnant too small to sustain the patient postoperatively - he decided to perform intraoperatively only a selective hepatico-jejunostomy on the left biliary system, dividing the liver parenchyma along the falciform ligament, thereby completely devascularizing segment 4. Finally, the right portal vein was ligated to induce hypertrophy on segments 2 and 3. On the 8<sup>th</sup>

# 1. Estratificação adequada

- A exploração durante a primeira cirurgia permite excluir enfermidade adicional que pode não ter sido detectada na avaliação pre-operatória.

*Schnitzbauer A, H. J. Schlitt HJ, et al. Annals of Surgery 2012*

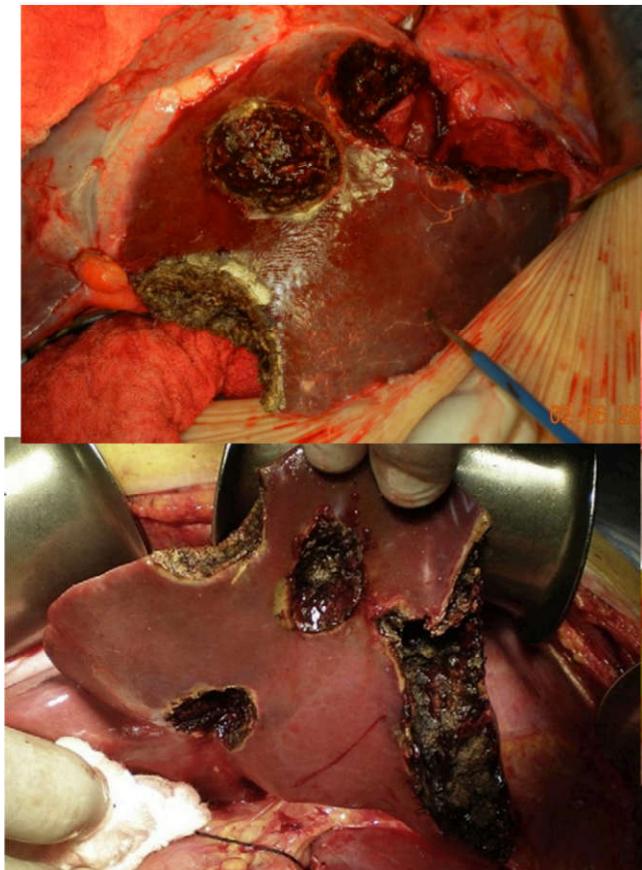
*Alvarez FA, Ardiles V, de Santibañes E et al. J Gastrointest Surg 2012*



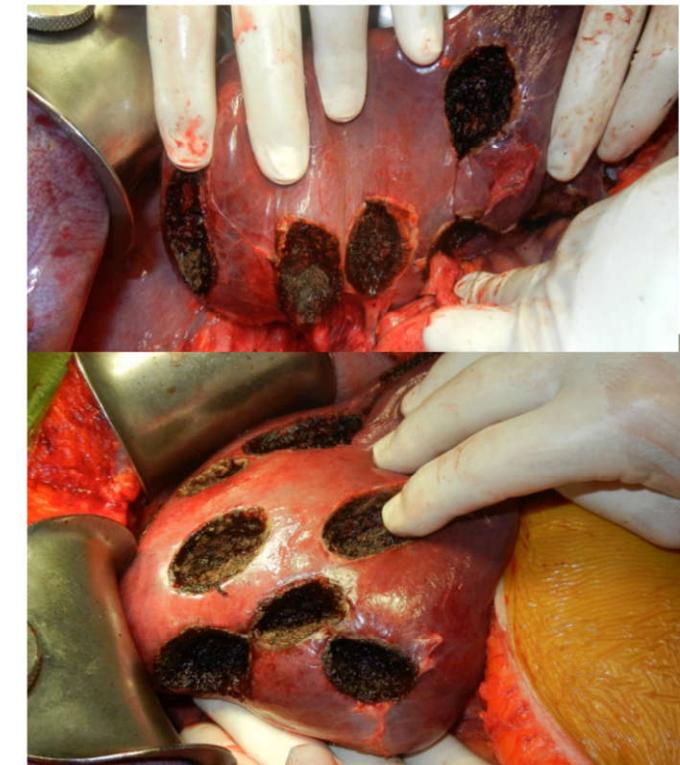
\*Cortesia Prof. Eduardo de Santibanes

## 2. Limpeza agressiva do remanescente

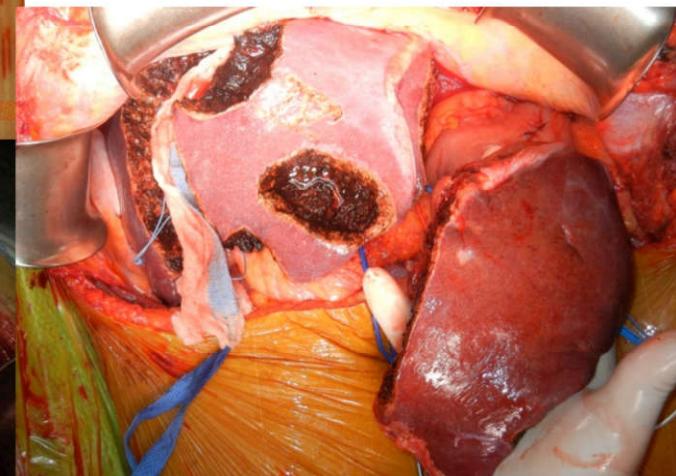
ALPPS direito



ALPPS esquerdo



Central

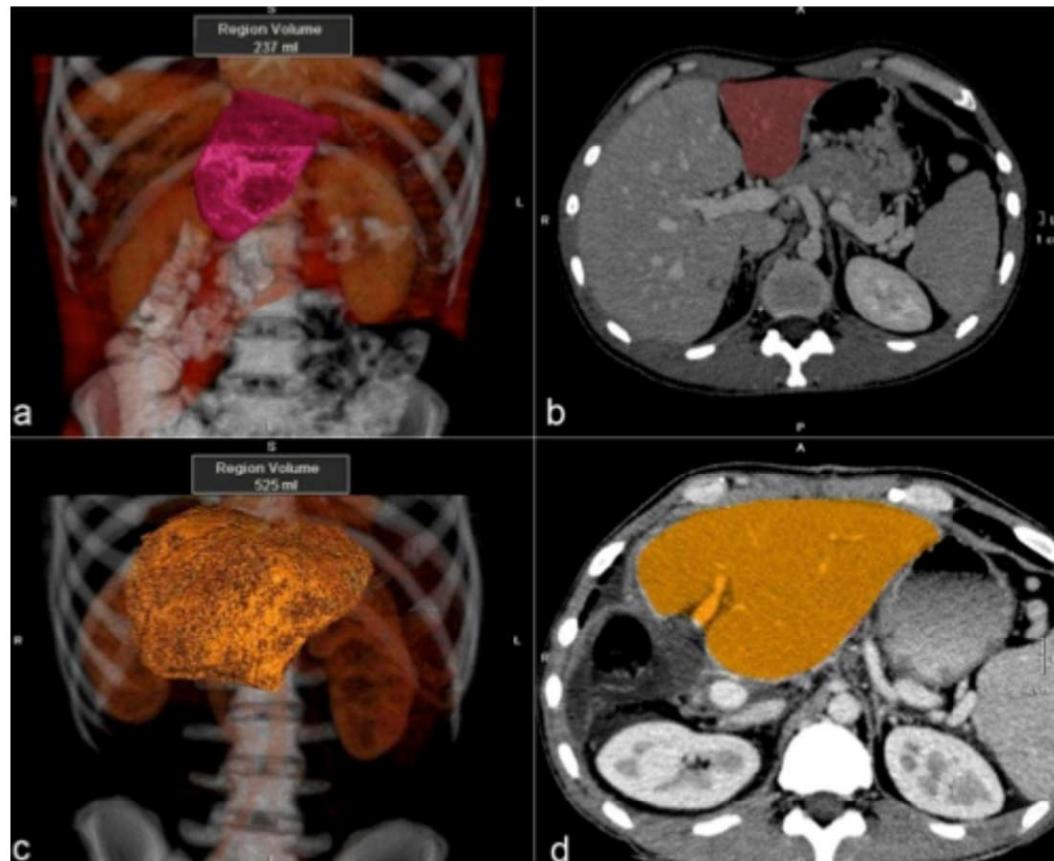


*de Santibañes E, Clavien PA. Ann Surg 2012.*

*de Santibañes E, Alvarez FA, Ardiles V. World J Surg 2012*

*Alvarez FA, Ardiles V, de Santibañes E et al. JOGS 2012*

### 3. Hipertrofia maciça e acelerada



Superior à E/LVP

- Homem 35 anos com CRLM.
- FOLFOX-Cetuximab (**14 ciclos**)

6 dias



**135% hipertrofia**

Até 200% de hipertrofia em uma semana

*Donati M, et al. Ann Surg. 2012*

*Ulla M, Ardiles V, de Santibañes E et al. Hepatogastroenterology 2012*

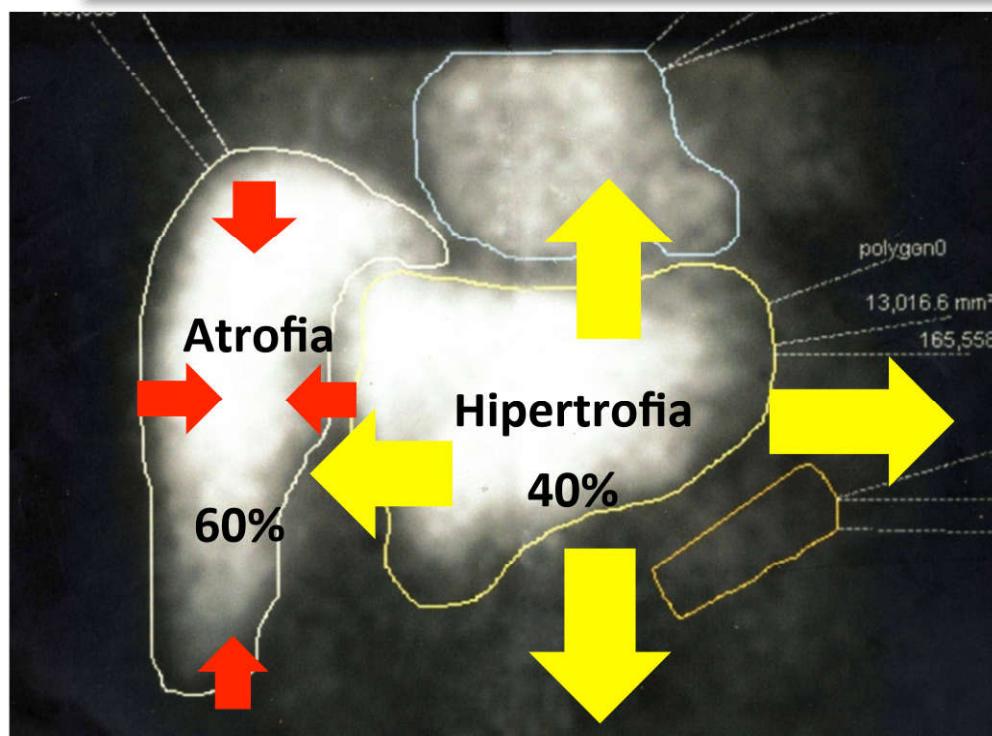
*Knoefel W T et al. British Journal of Surgery 2013*

**\*Cortesia Prof. Eduardo de Santibanes**

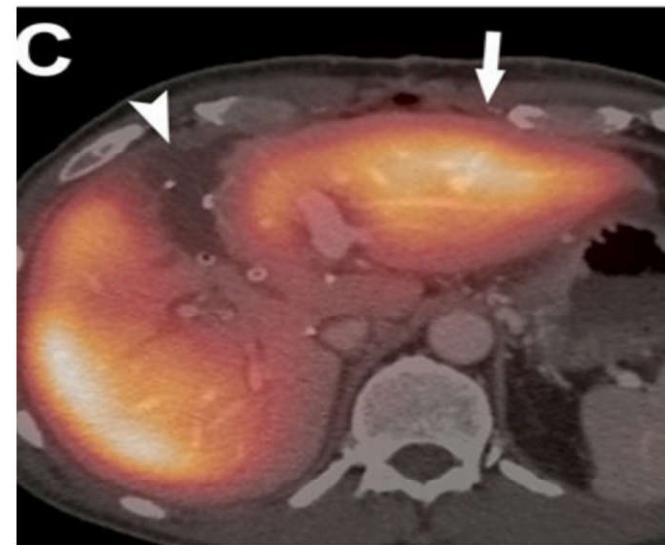
# 4. Fígado auxiliar temporário

## How to Avoid Postoperative Liver Failure: A Novel Method

Eduardo de Santibañes • Fernando A. Alvarez • Victoria Ardiles



Fígado doente responsável por 60% da função total até o 6º dia

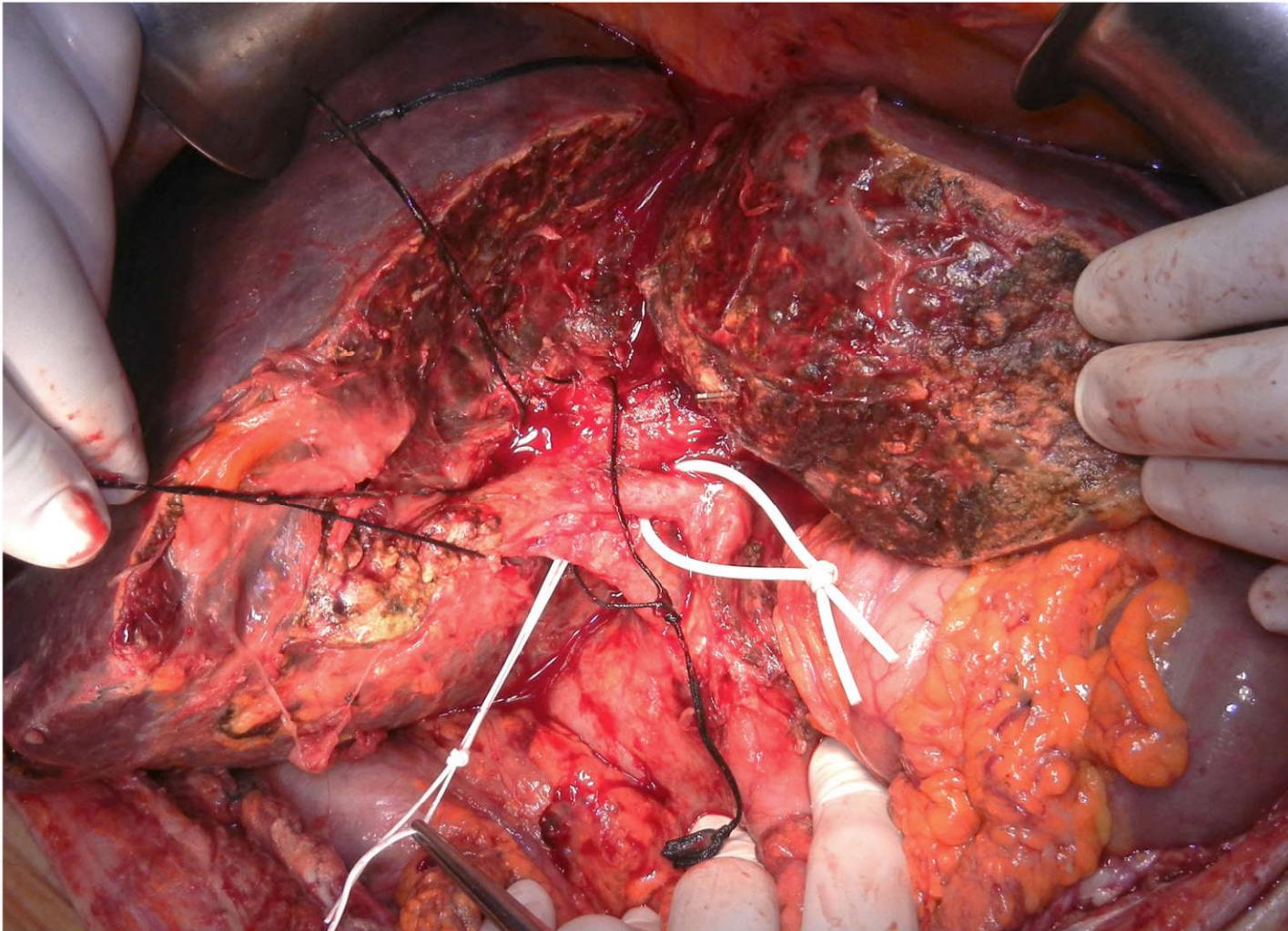


Dokmak S, Belghiti J. Ann Surg 2012.

de Santibañes E, Alvarez FA, Ardiles V. World J Surg 2012.

\*Cortesia Prof. Eduardo de Santibanes

## 5. Menos aderências



Em contraste com a hepatectomia em 2-tempos clássica,  
o curto intervalo impede a formação de aderências.

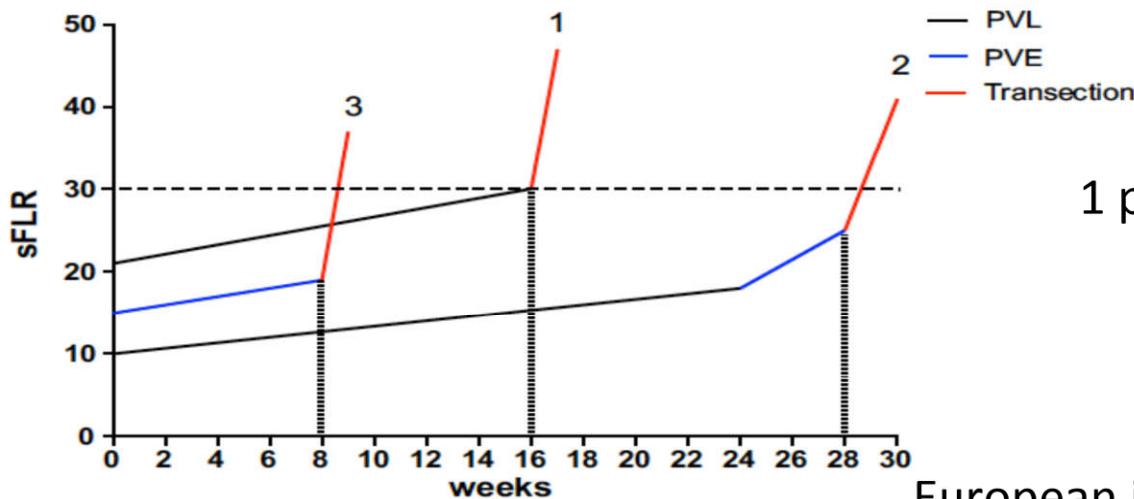
# 6. ALPPS no resgate da EVP/LVP

**Salvage Parenchymal Liver Transection for patients with**

**Insufficient volume increase after Portal Vein occlusion**

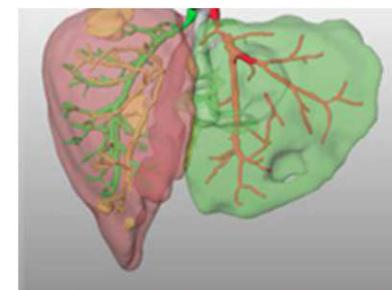
**- An extension of the ALPPS approach -**

Christoph Tschuor\*&, MD, Kris P. Croome\*&, MD, Gregory Sergeant\*, MD, PhD, Virginia Cano+, MD,  
Silke Schadde\*, MD, Victoria Ardiles+, MD, Ksenija Slankamenac\*, MD, Rodrigo Sanchez Clariá +, MD,  
Eduardo de Santibañes +, MD, PhD, Roberto Hernandez-Alejandro #&, MD and  
Pierre-Alain Clavien \*&, MD, PhD

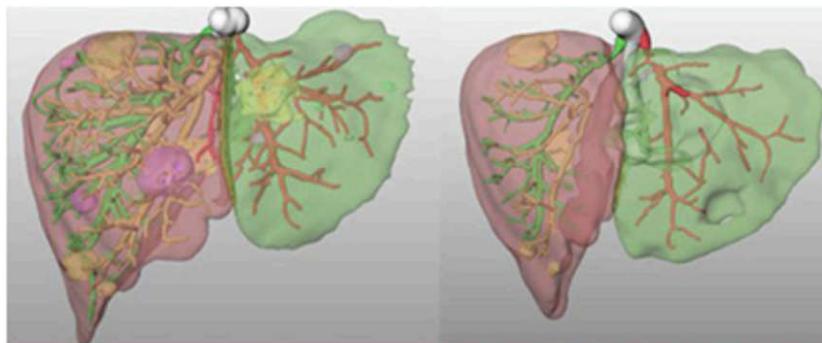


1 paciente com PVL- PVE (S4)  
e embolização veia  
suprahepática direita.

# ALPPS



- Ressecção simultânea na primeira operação em doença sincrônica.
- O intervalo curto torna pouco provável a progressão tumoral.
- Na progressão tumoral no hemifígado doente, não há invasão por contiguidade.



# 1 st International Consensus Meeting on ALPPS

February 27<sup>th</sup> and 28<sup>th</sup> 2015, Hamburg, Germany

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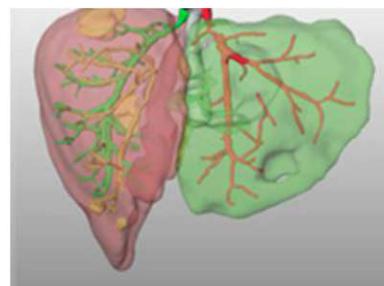


European-African Hepato-Pancreato-Biliary Association

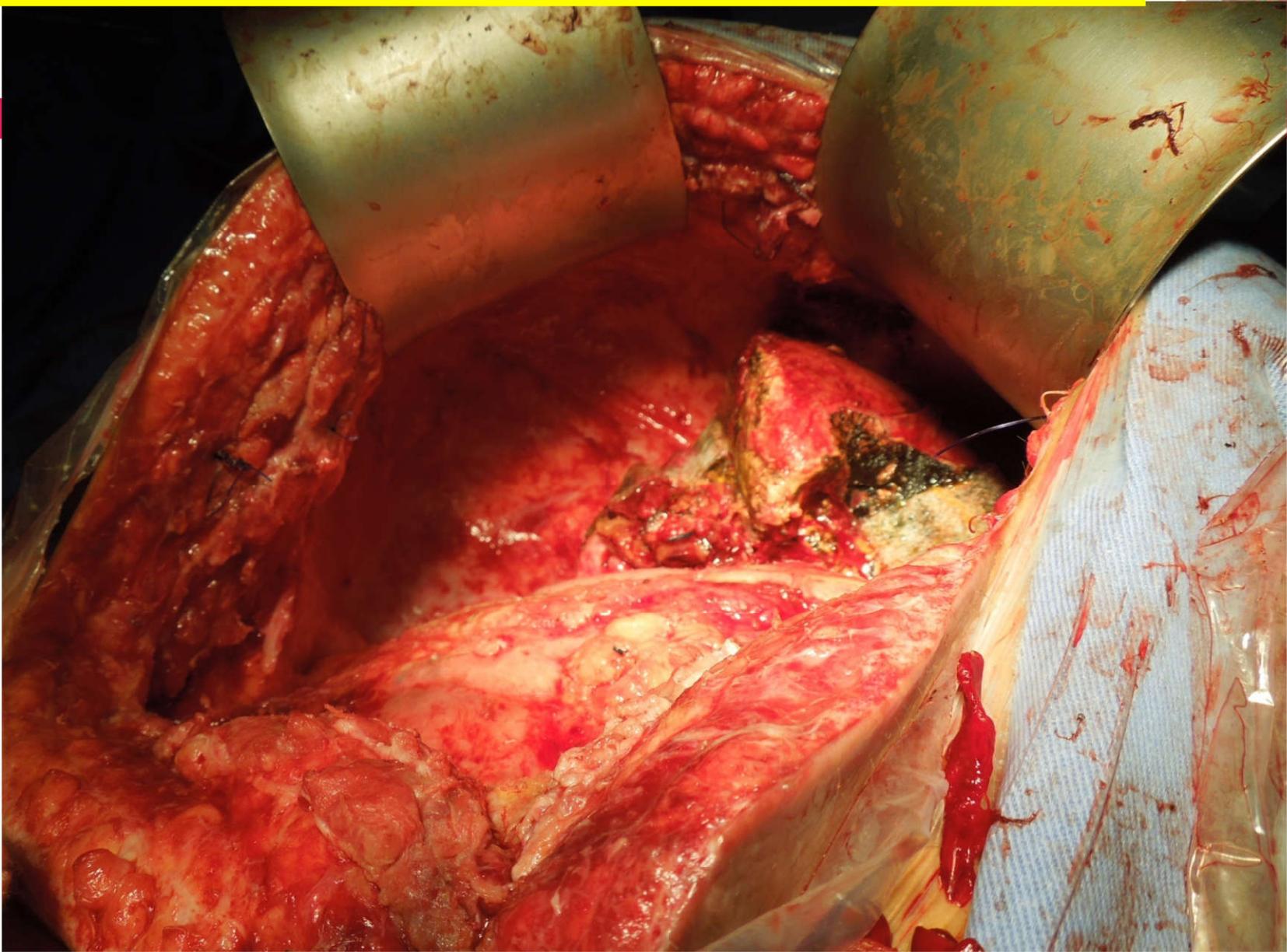
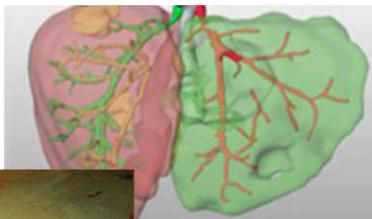
Supported with a grant of DFG

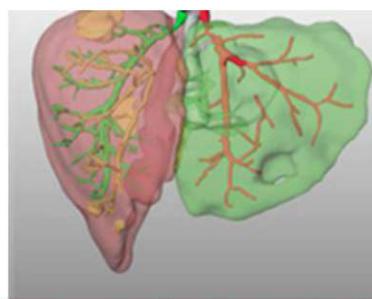
**DFG** Deutsche  
Forschungsgemeinschaft

# Brazil



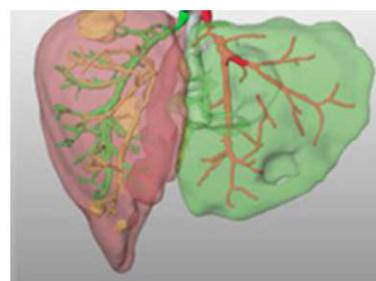
# HEPATECTOMIA DIREITA AMPLIADA





**TABLE 2.** Main Operative Characteristics of 202 Patients in the ALPPS Registry

Variable	All Patients (n = 202)
Laparoscopic/robotic ALPPS, n (%)	5 (3)
Type of ALPPS*	
<i>Right hepatectomy ALPPS, n (%)</i>	106 (52)
<i>Right trisectionectomy ALPPS + Sg 1, n (%)</i>	69 (34)
<i>Right trisectionectomy ALPPS – Sg 1, n (%)</i>	17 (8)
Other types†, n (%)	10 (5)



**TABLE 2.** Intraoperative Data in 30 Patients Treated

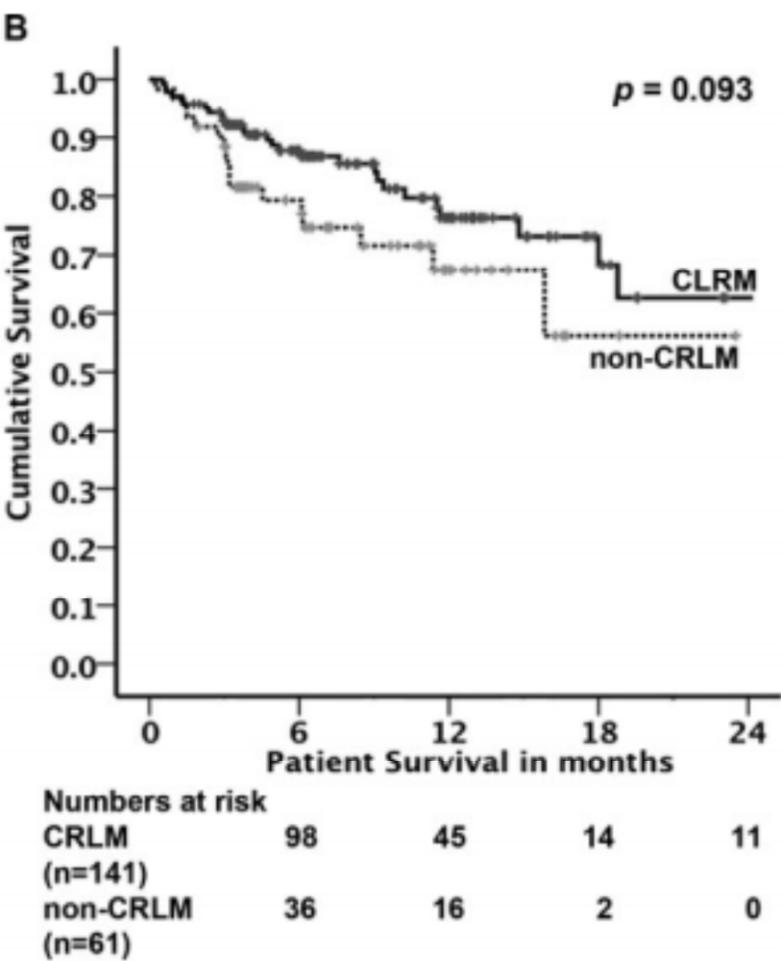
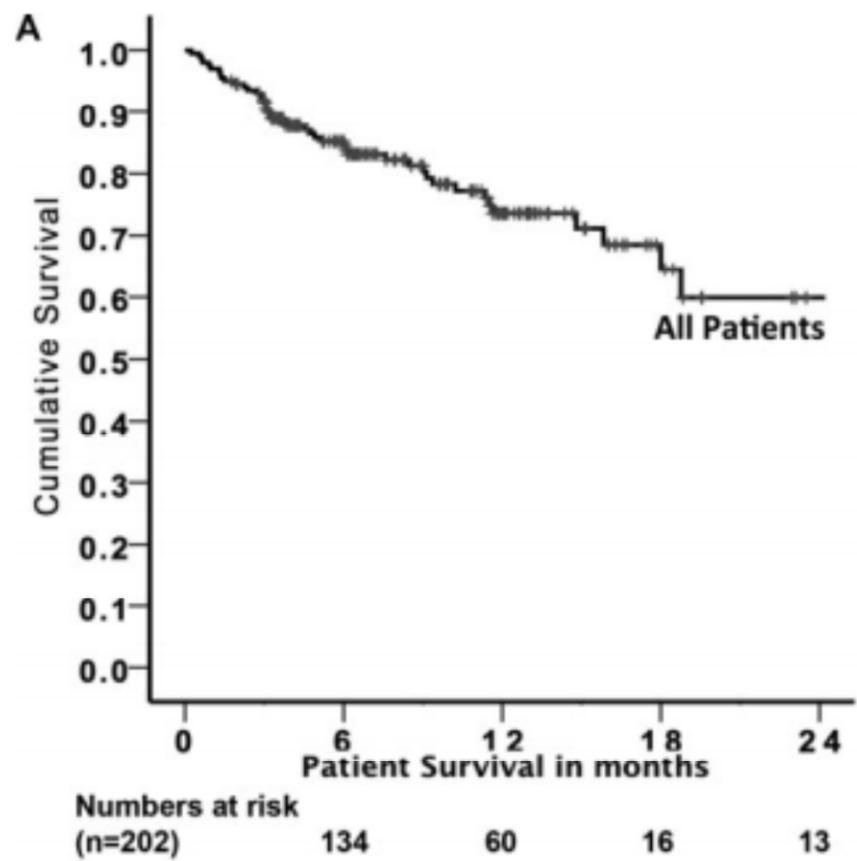
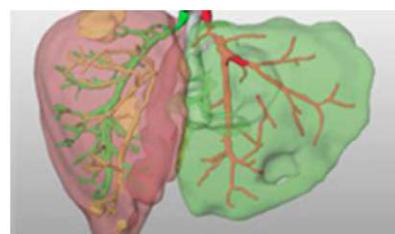
Characteristic	1st Stage	2nd Stage
Type of major liver resection, n (%)		
Right hepatectomy	—	8 (28)
Right trisectionectomy	—	20 (69)
Left trisectionectomy	—	1 (3)

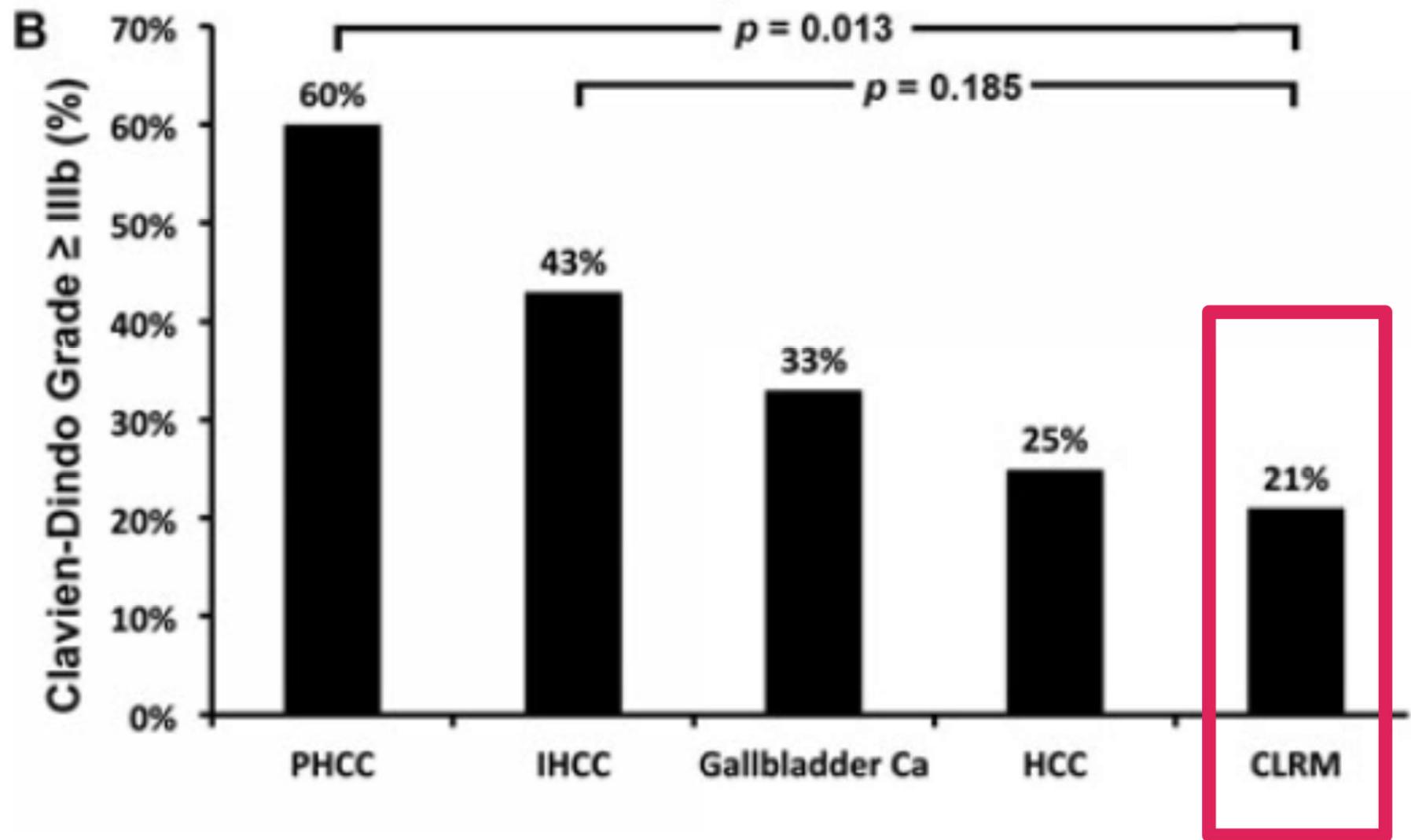
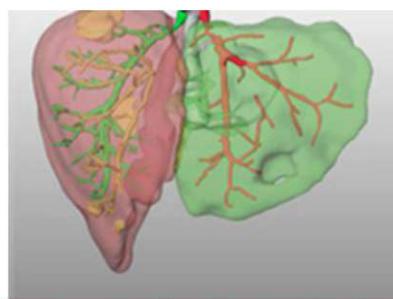


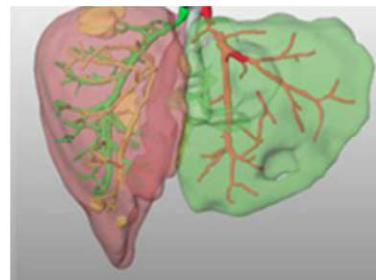
# METÁSTASE HEPÁTICA COLO-RETAL EXTENSA

**TABLE 1.** Main Characteristics of 202 Patients in the ALPPS Registry

Variable of Interest	All Patients (n = 202)
Age, median (IQR), yr	60 (53–68)
Sex, male/female, number (%)	121/81(60%/40%)
Ethnic origin	
White, n (%)	188 (93)
Asian, n (%)	10 (5)
Other*, n (%)	4 (2)
Tumor type	
CRLM, n (%)	141 (70)
HCC, n (%)	17 (8)
PHCC, n (%)	11 (5)
IHCC, n (%)	8 (4)
NET, n (%)	8 (4)
Gallbladder cancer, n (%)	6 (3)
Others, n (%)	11 (5)



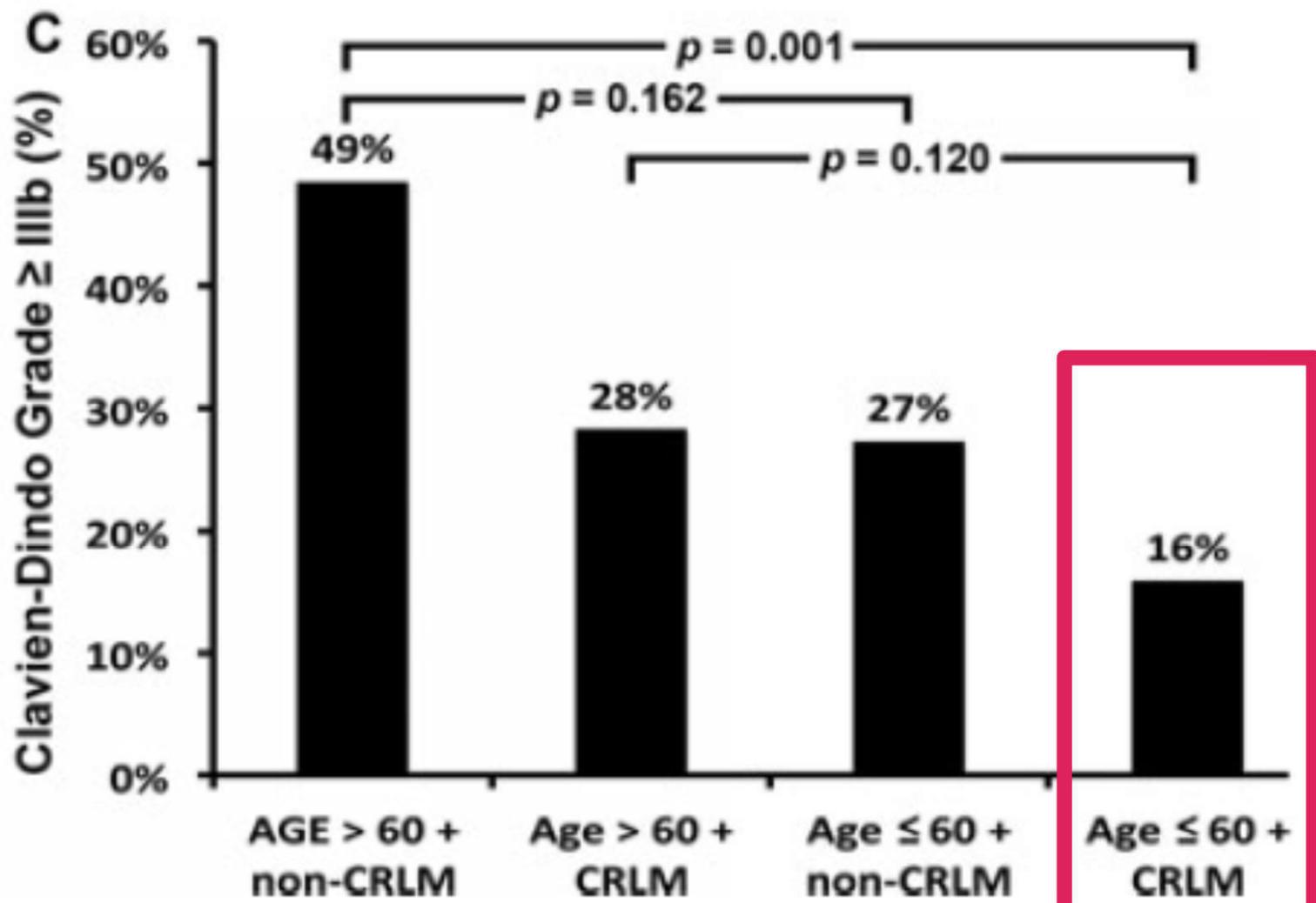
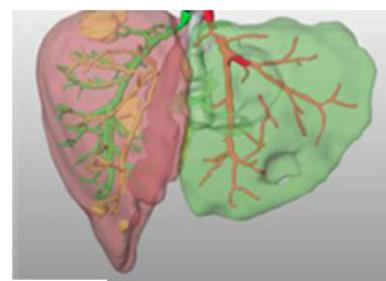




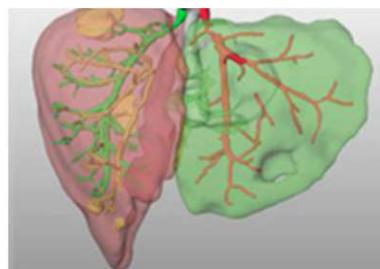
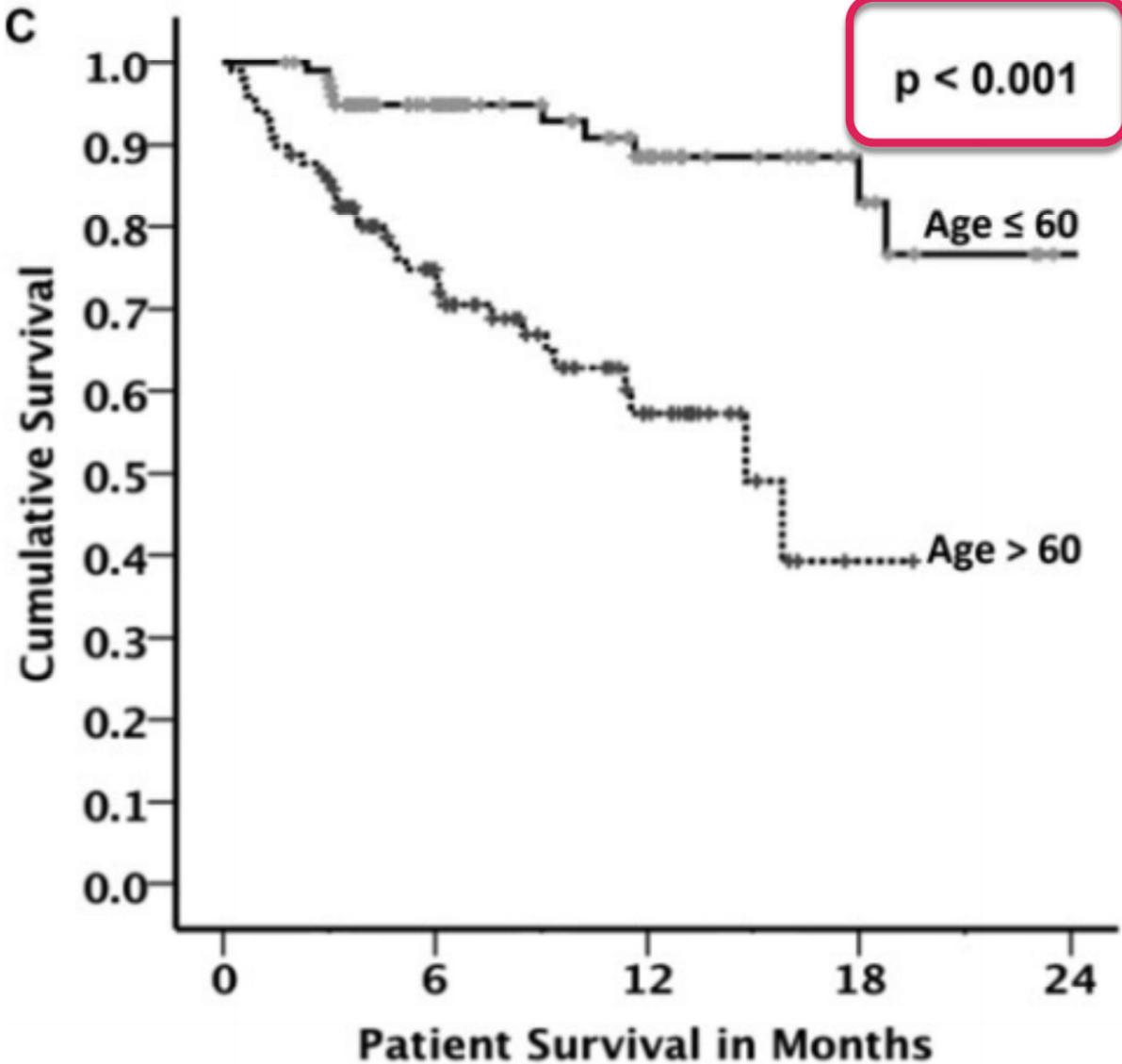
**TABLE 3.** Main Postoperative Outcomes of 202 Patients in the ALPPS Registry

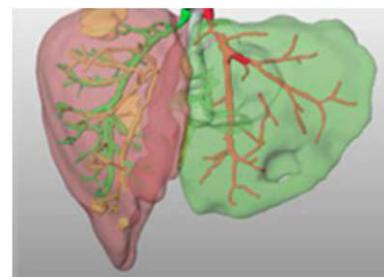
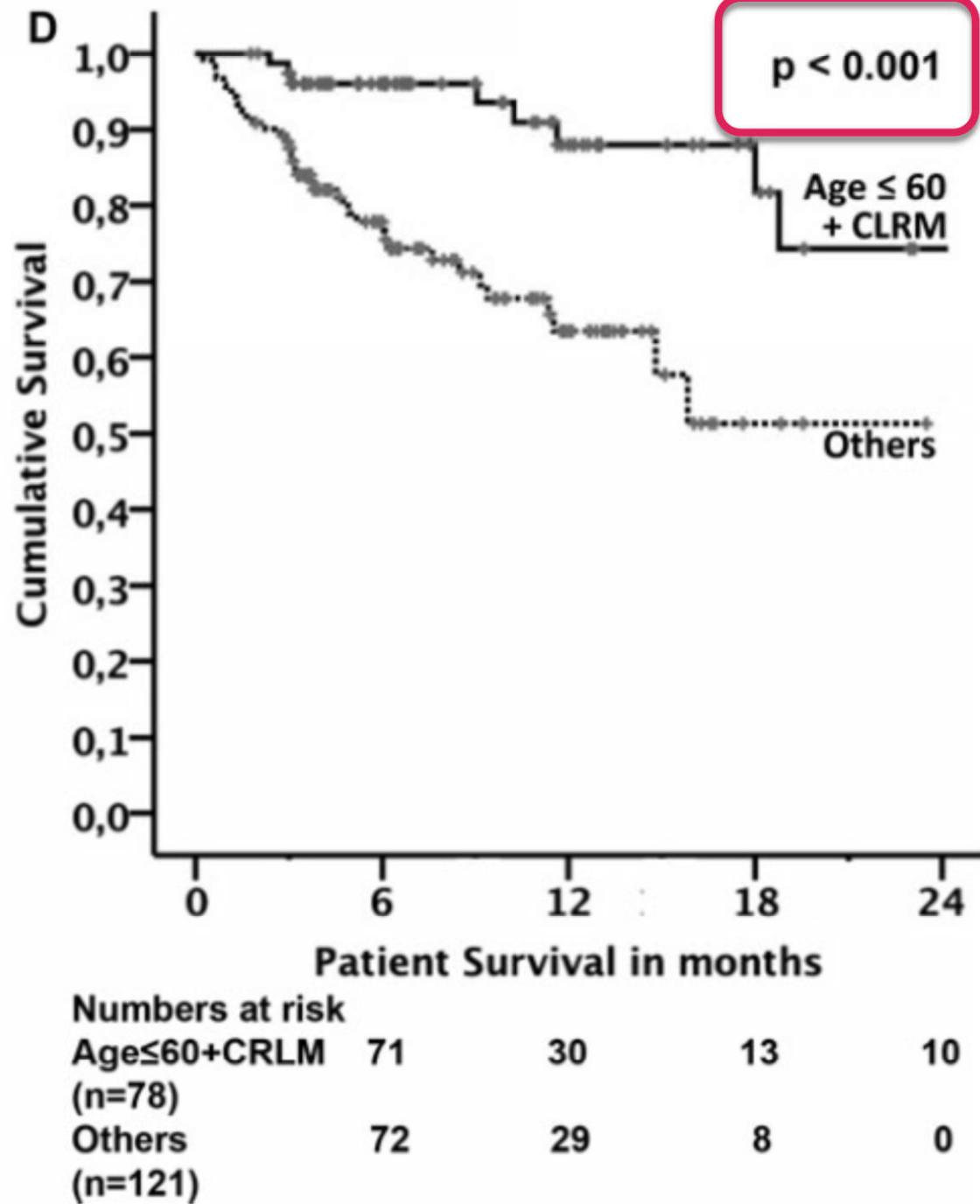
Variable	All Patients (n = 202)
Failure to reach stage II, n (%)	5 (2)
30-d mortality, n (%)	5 (2)
In-hospital mortality, n (%)	18 (9)
90-d mortality	
In all patients n (%)	19 (9)
In CRLM, n (%) (no. total CRLM)	11 (8%) (n = 141)
In HCC, n (%) (no. total HCC)	2 (12%) (n = 17)
In PHCC, n (%) (no. total PHCC)	3 (27%) (n = 11)
In IHCC, n (%) (no. total IHCC)	1 (13%) (n = 8)
In NET, n (%) (no. total NET)	0 (0%) (n = 8)
In gallbladder cancer (%) (no. total gallbladder cancer)	2 (33%) (n = 6)

# IDADE < 60 ANOS

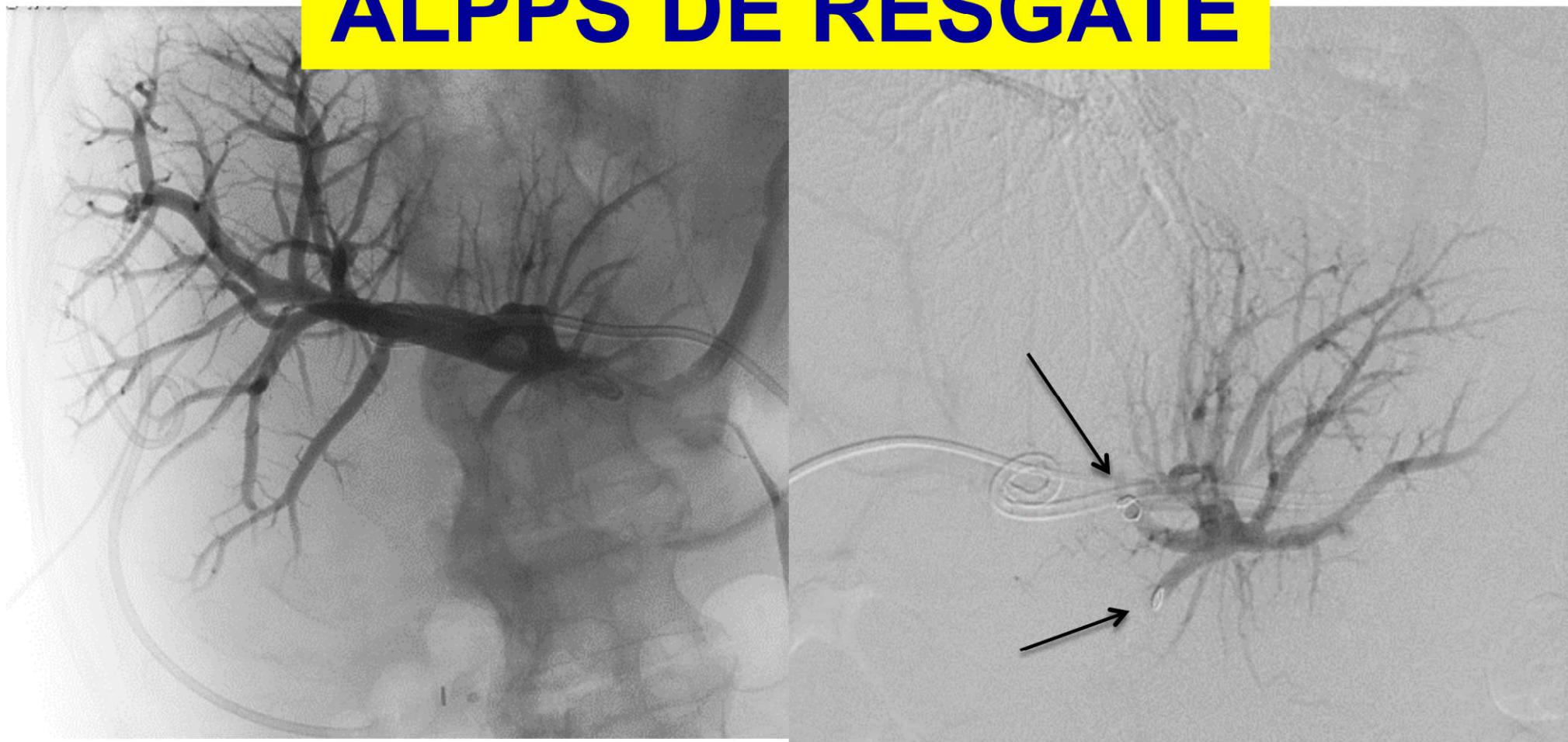


C

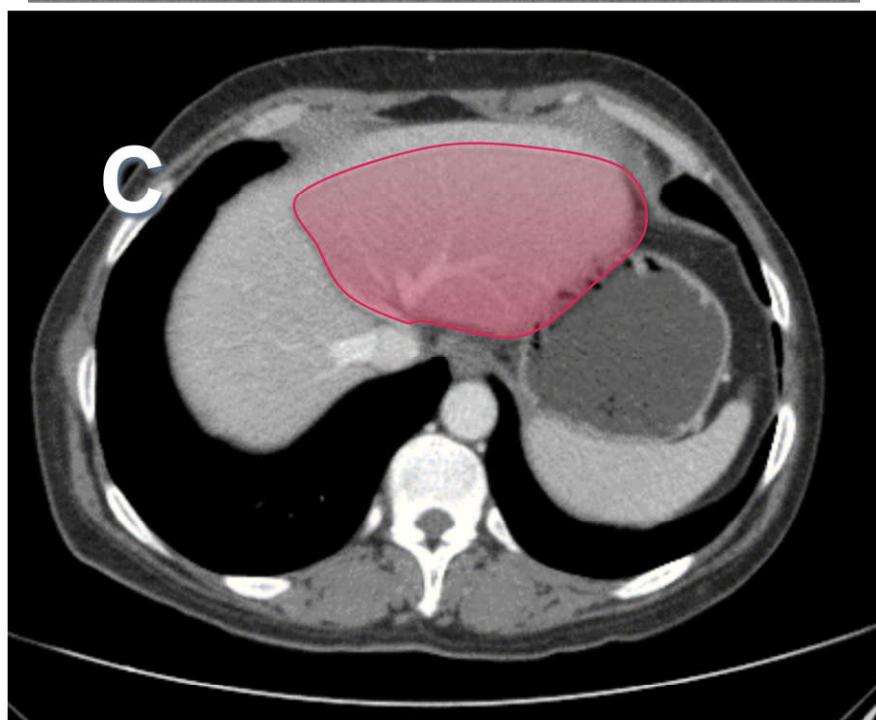
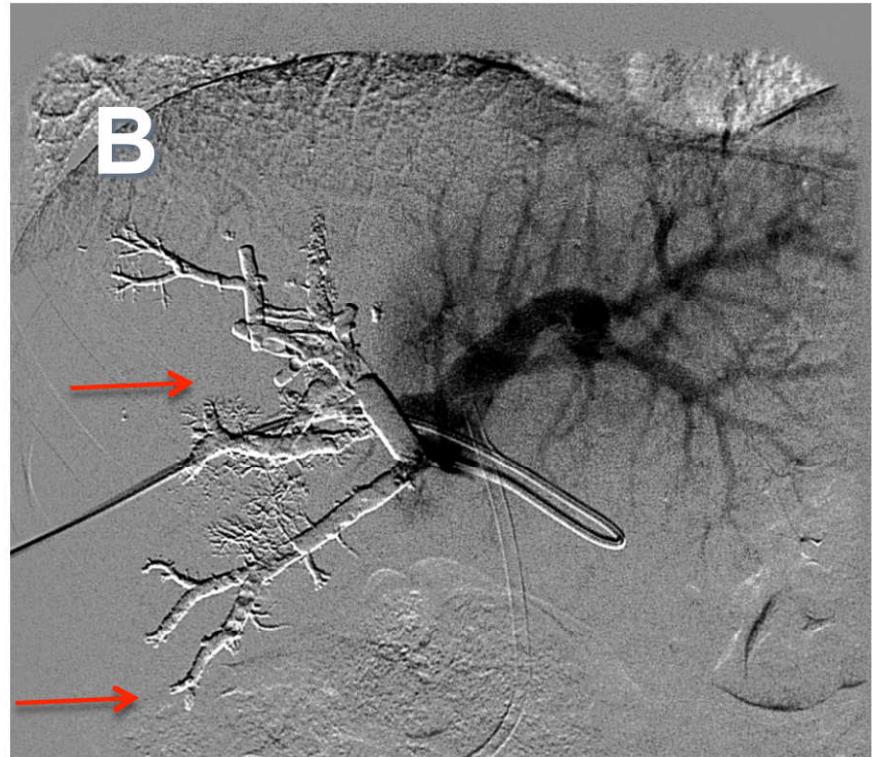
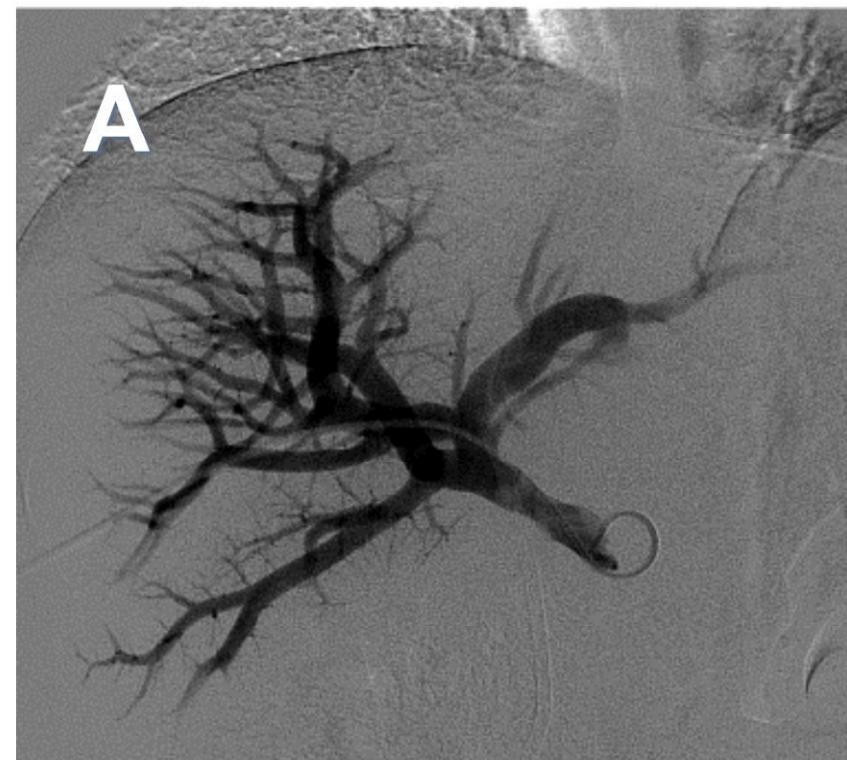


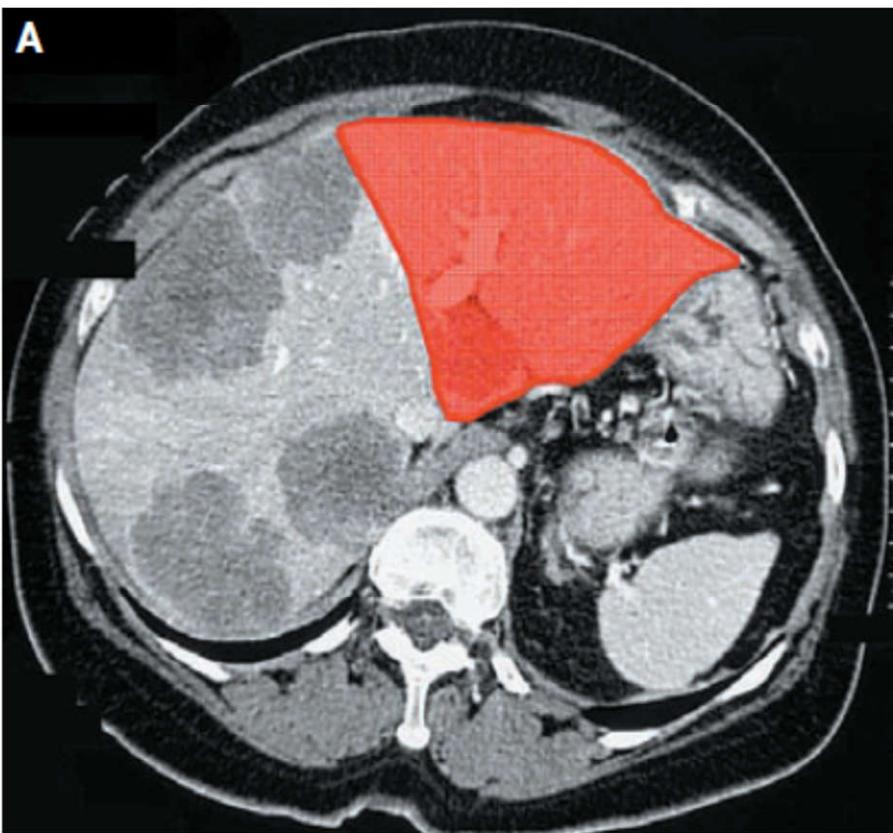
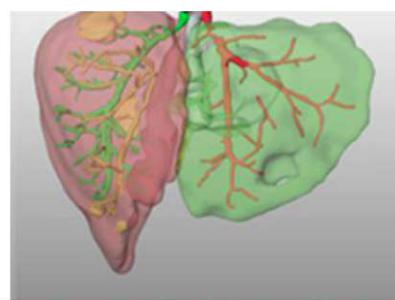


# ALPPS DE RESGATE

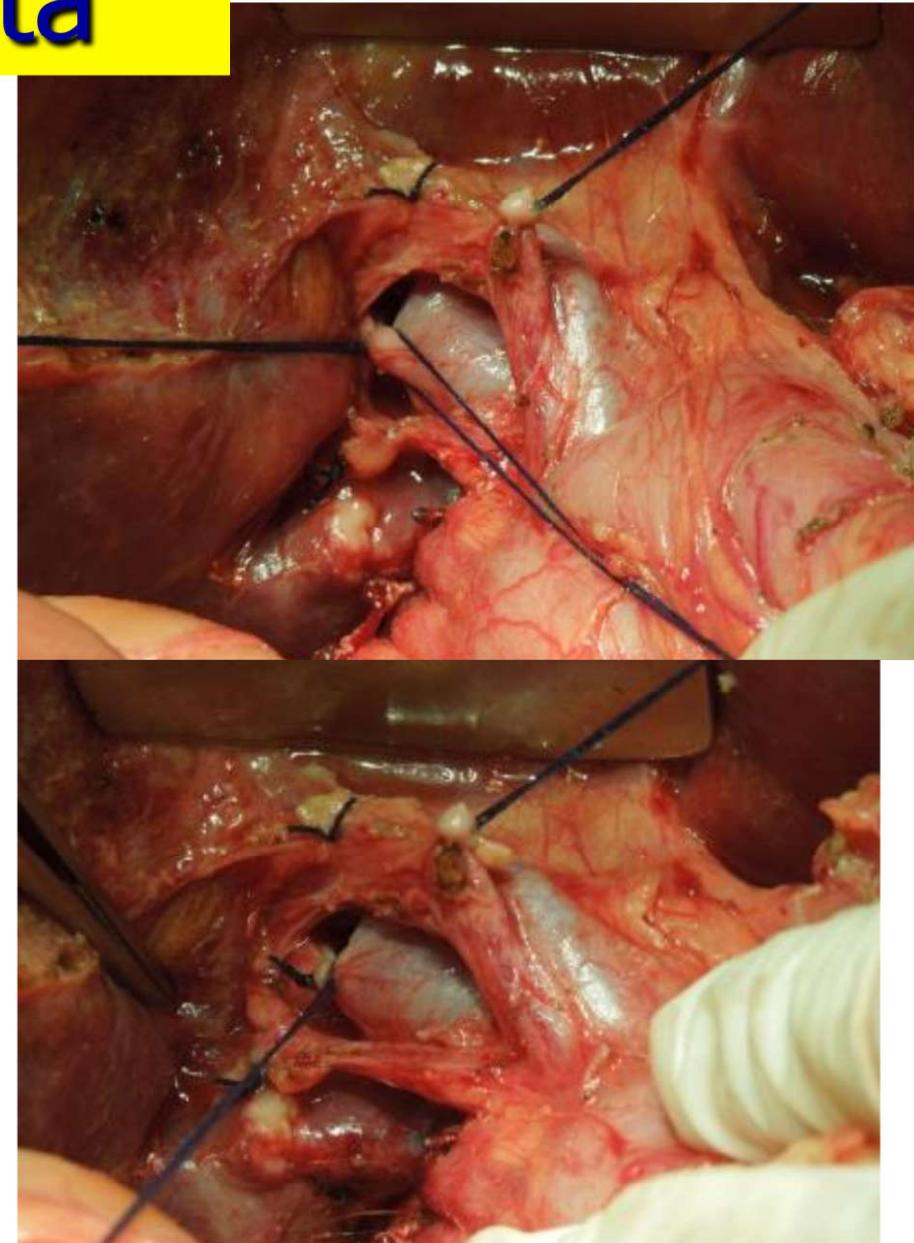
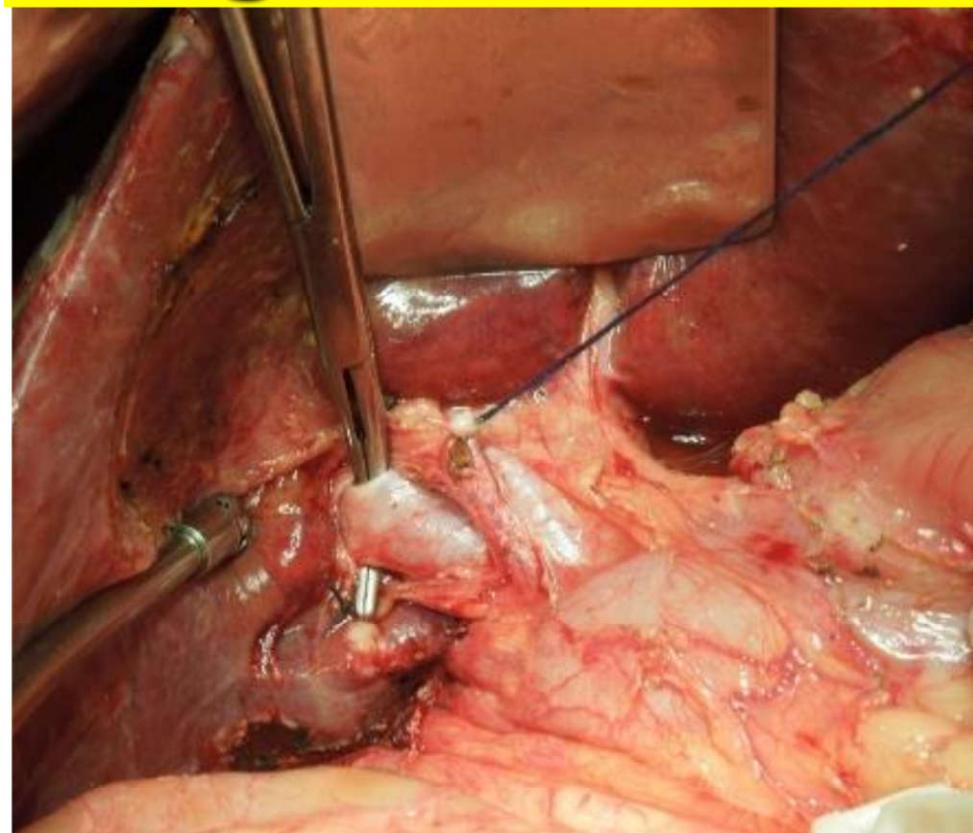


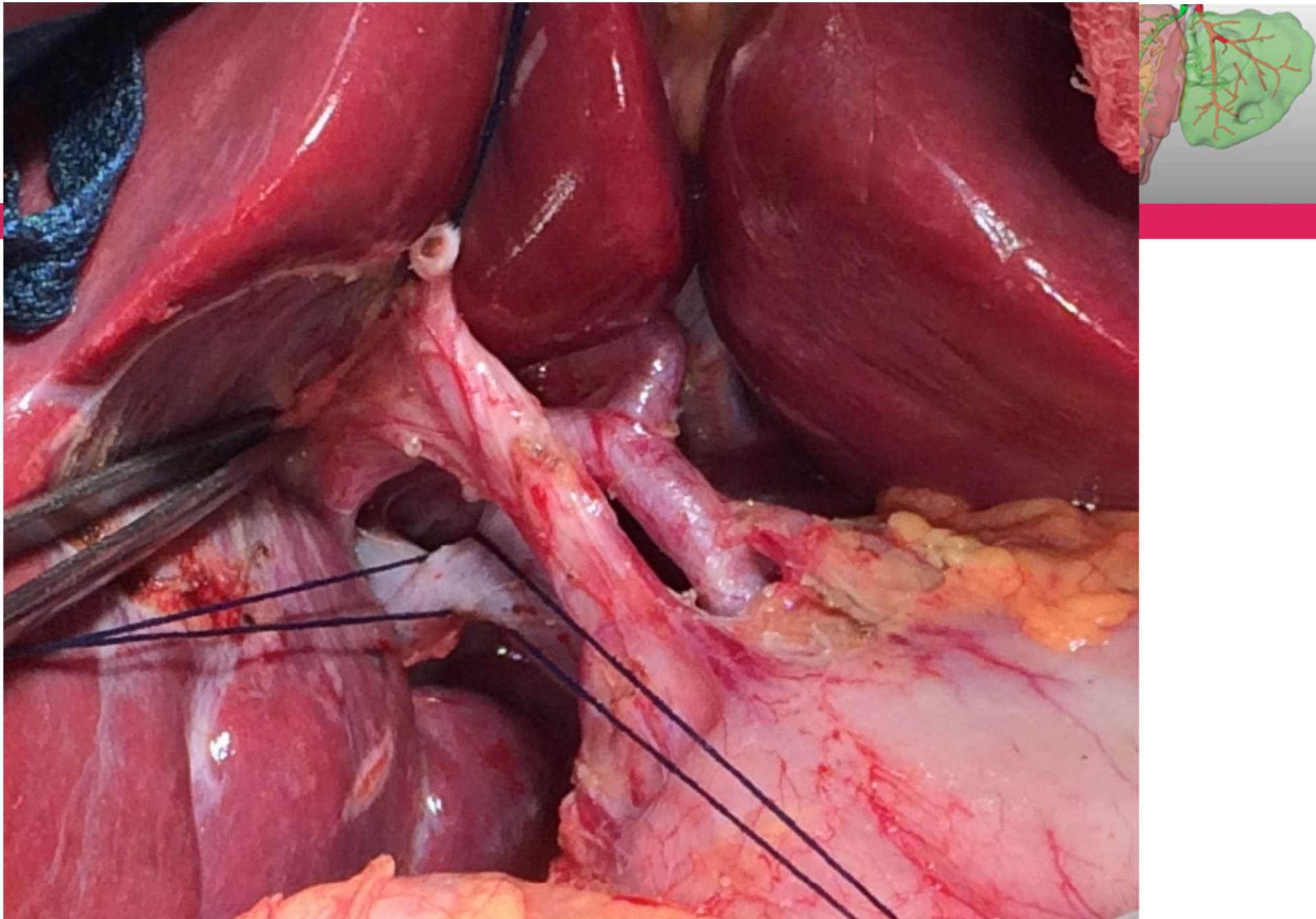
(A) Portografia direita com catéter pigtail através de acesso ipsilateral. (B) Após microcateterização seletiva dos principais ramos do segmento 4 (setas), realizada embolização com micropartículas e micromolas. Notar a preservação do fluxo portal normal nos demais ramos do lobo esquerdo. O procedimento prosseguiu com embolização dos ramos portais direitos com NBCA.

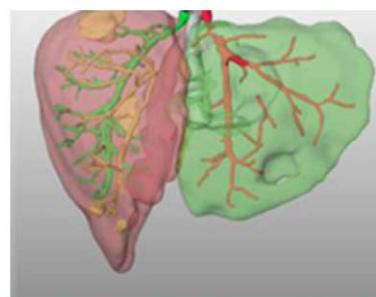




# Ligadura da veia porta

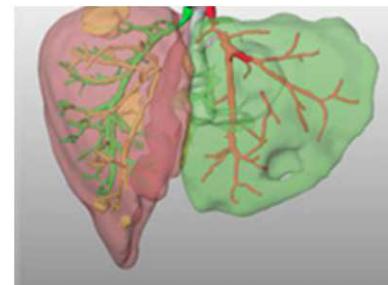




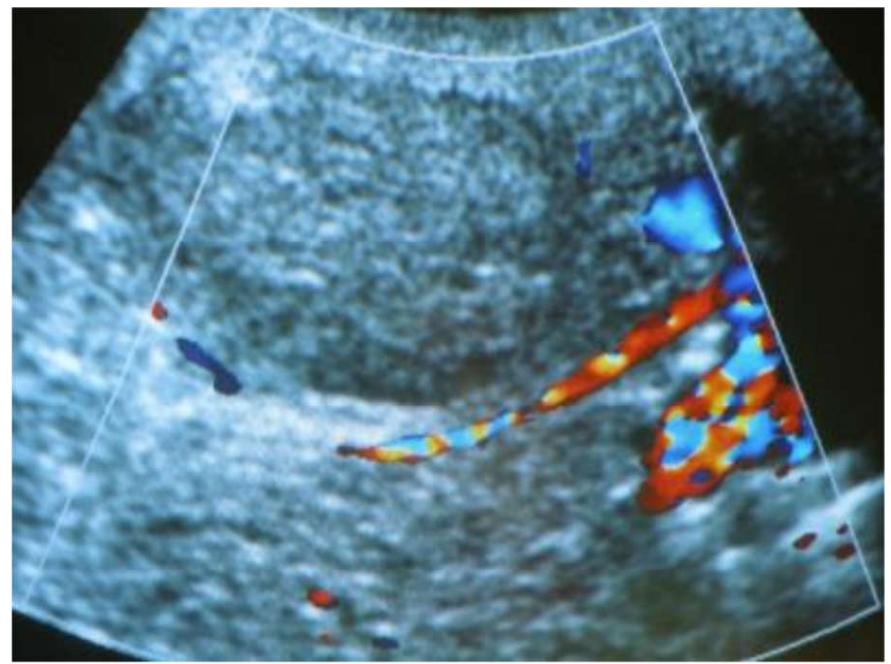


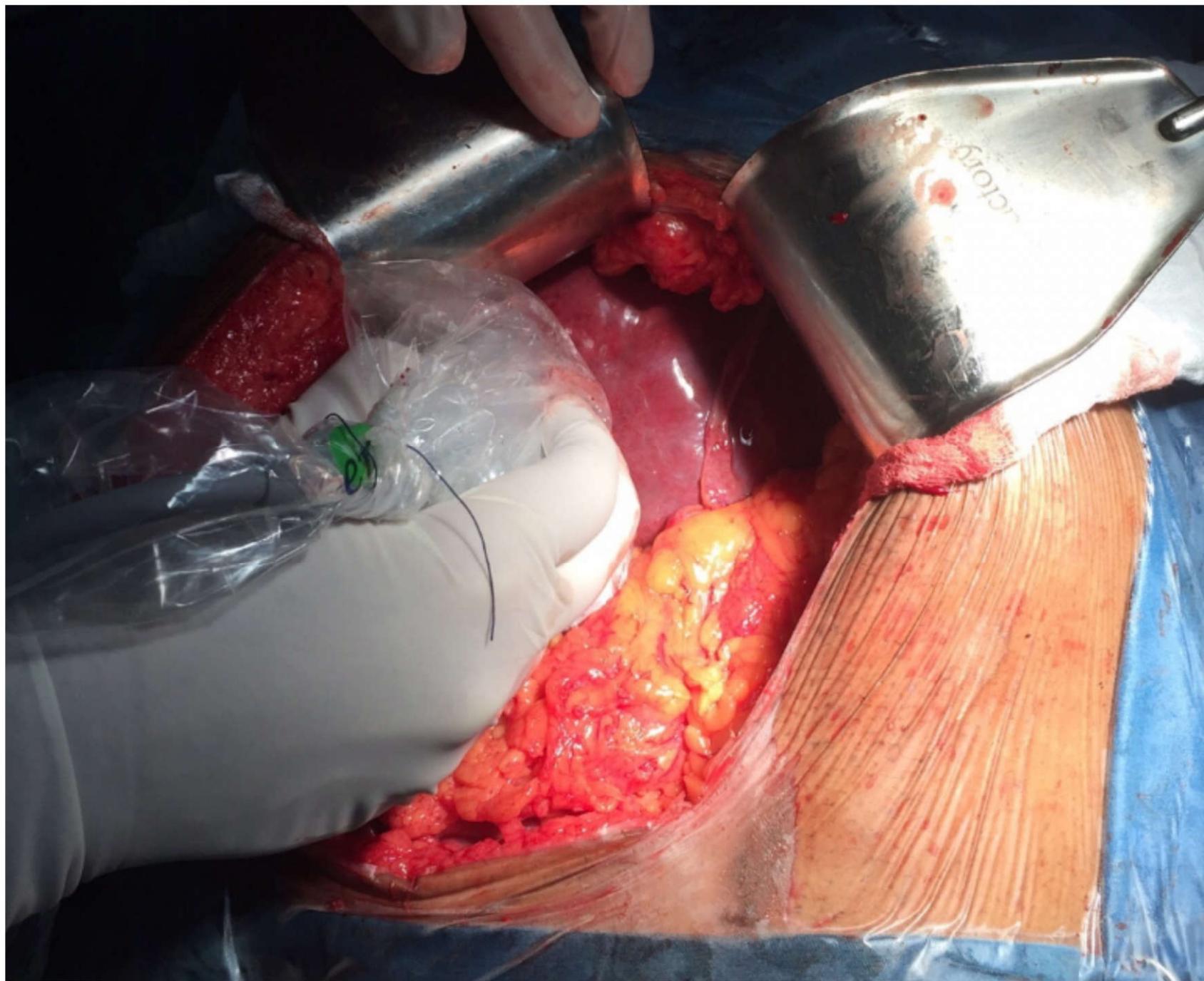
**Table 2** Comparison of liver volume in patients undergoing extended right hepatectomy

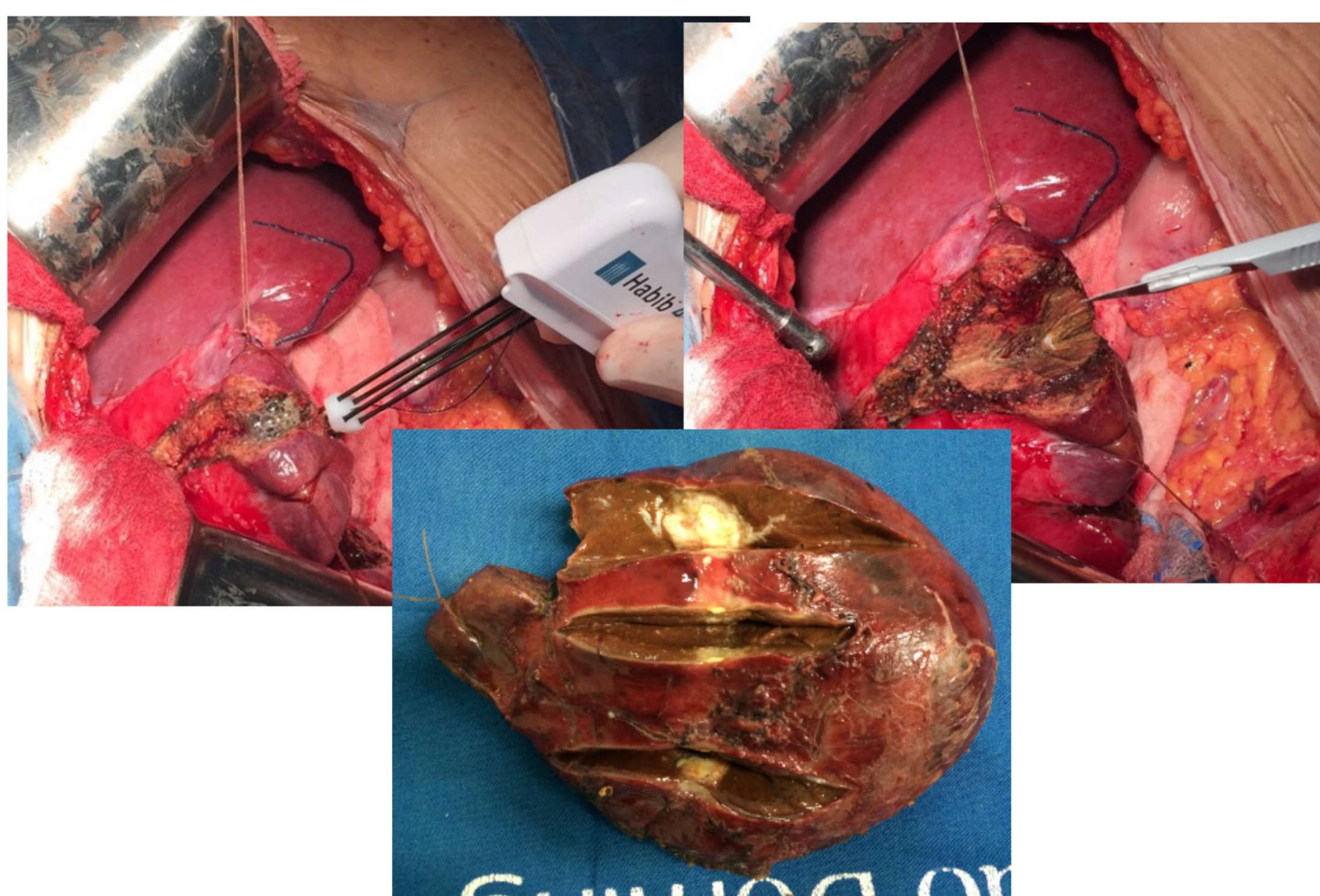
	<b>RPVE (n = 6)</b>	<b>RPVE + IV (n = 12)</b>
FLR volume pre-PVE, mL, median (IQR)	532.1 (410.7–614.2)	441.0 (256.9–513.0)
FLR volume post-PVE, mL, median (IQR)	739.4 (694.9–813.2)	579.6 (420.0–703.3)
Change in volume, mL, median (IQR)	139.9 (125.3–299.7)	140.9 (119.3–243.8)
sFLR pre-PVE, %, median (IQR)	26.5 (20.7–37.2)	23.8 (18.9–29.9)
sFLR post-PVE, %, median (IQR)	37.5 (22.2–57.2)	35.7 (24.9–42.5)
Degree of hypertrophy, %, median (IQR)	23.8 (20.7–62.3)	38.3 (26.0–87.2)



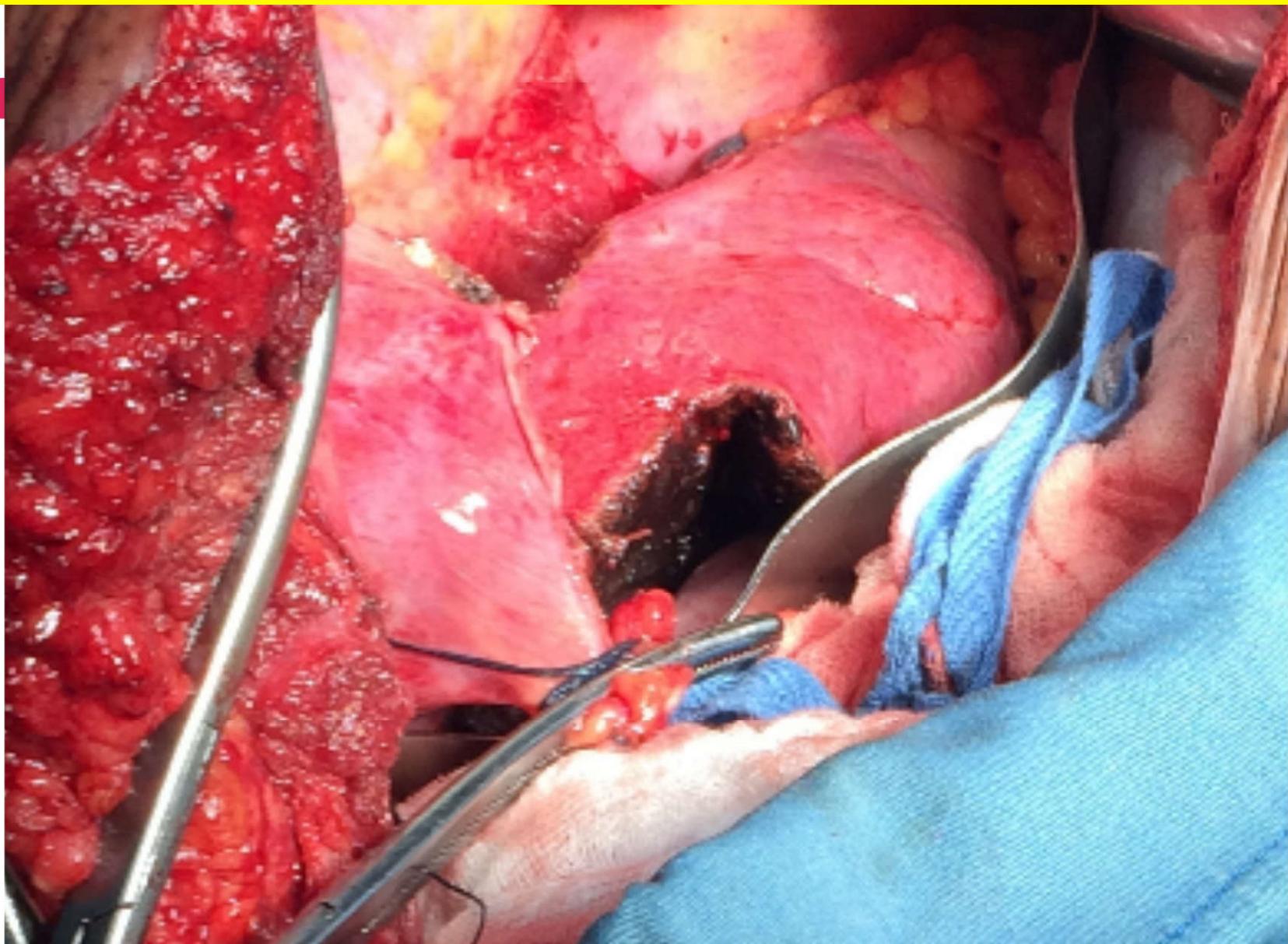
**Margem do tumor próximo ao  
remanescente hepático  
(ou seu pedículo vascular)**







# EXTENSÃO TUMORAL INESPERADA



SIGNA EXCITE 1.5T GEHCMR02

Ex: 49  
Se: 12  
Im: 52  
DAX S180.7

ASR

INSTITUTO DE

Acc Nu  
PAULO DE

EXCITE 1.5T GEHCMR02

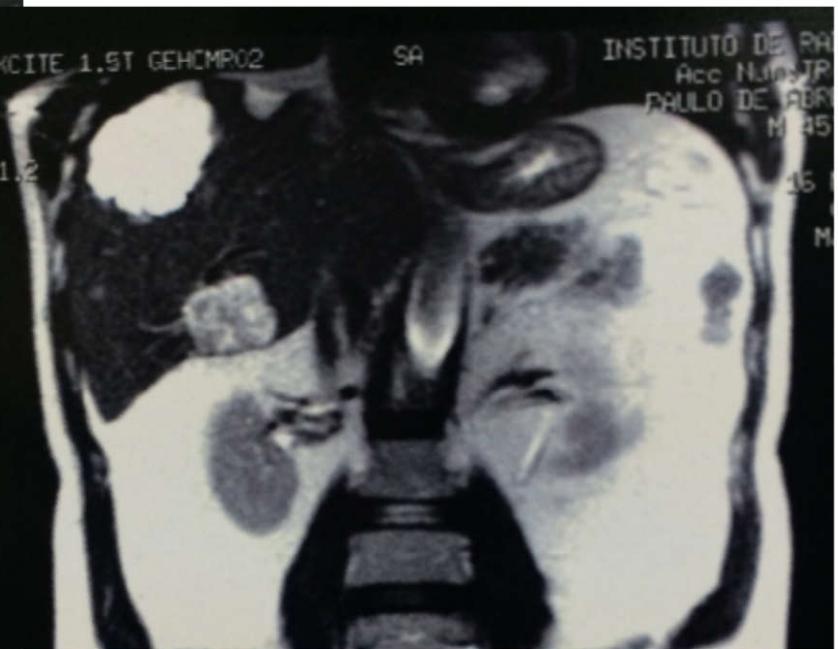
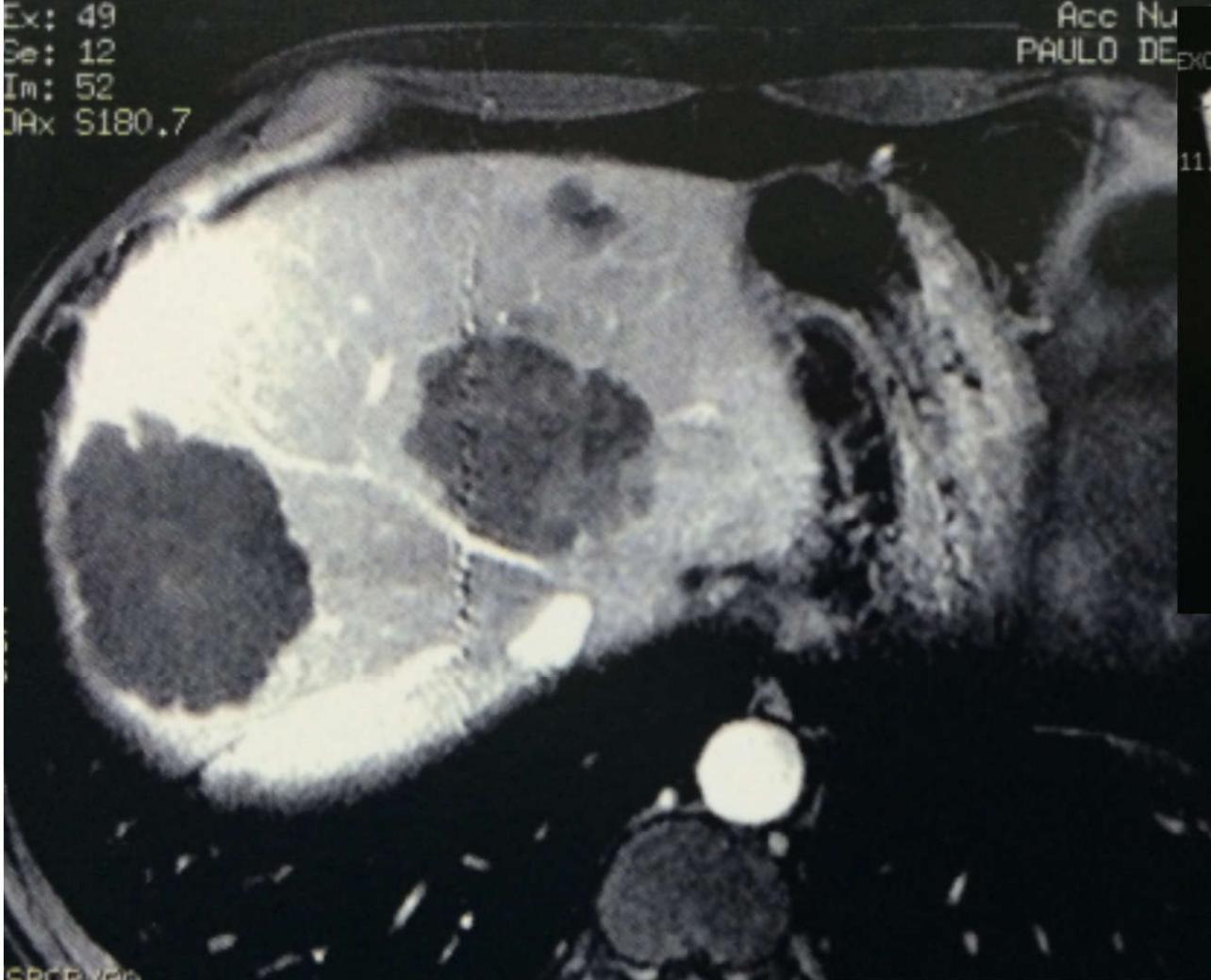
SA

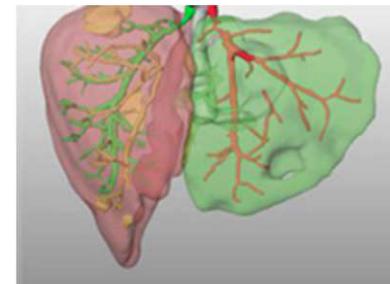
INSTITUTO DE PA  
Acc Nu, JP  
PAULO DE ABRE

15

M

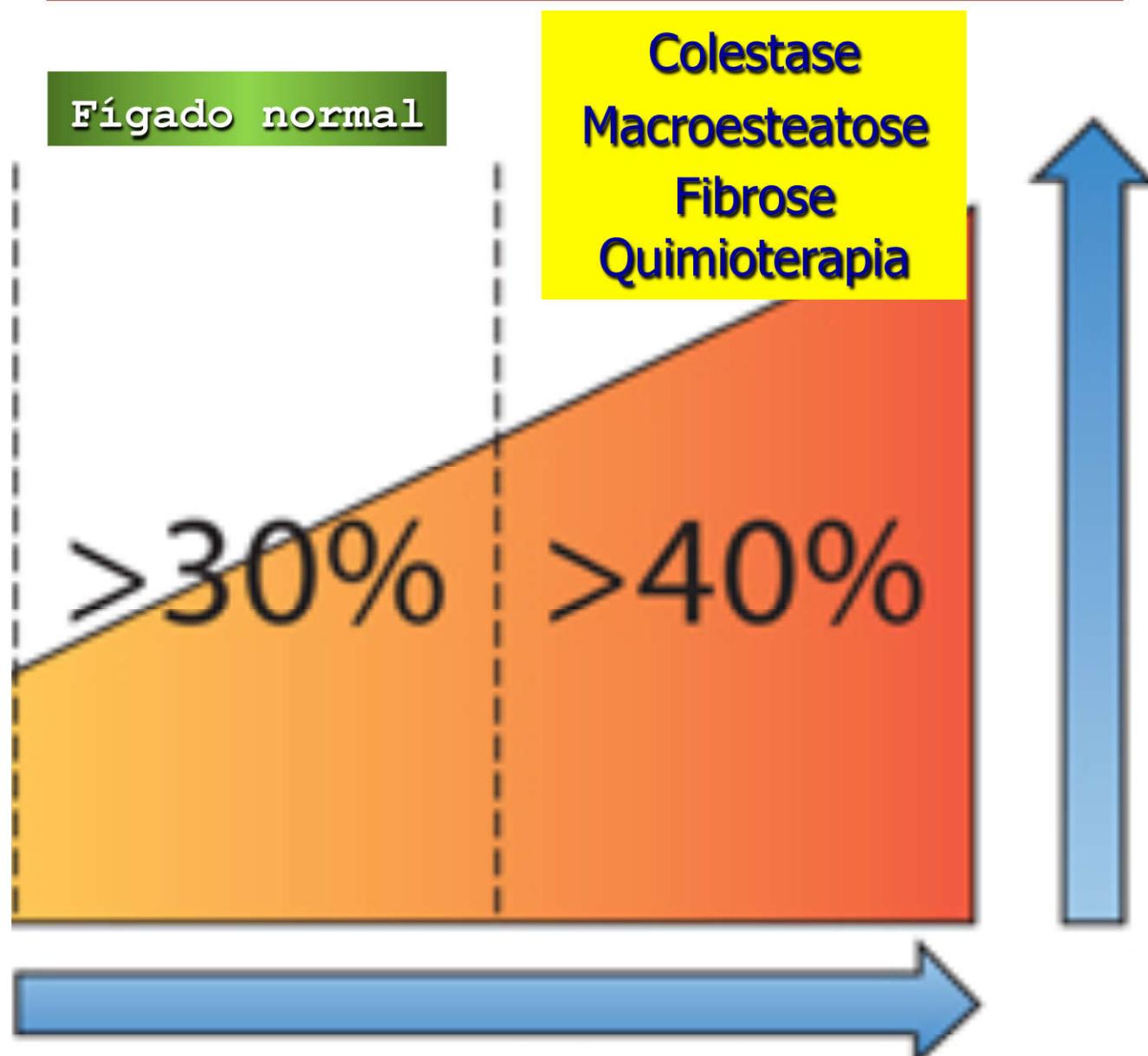
11.2

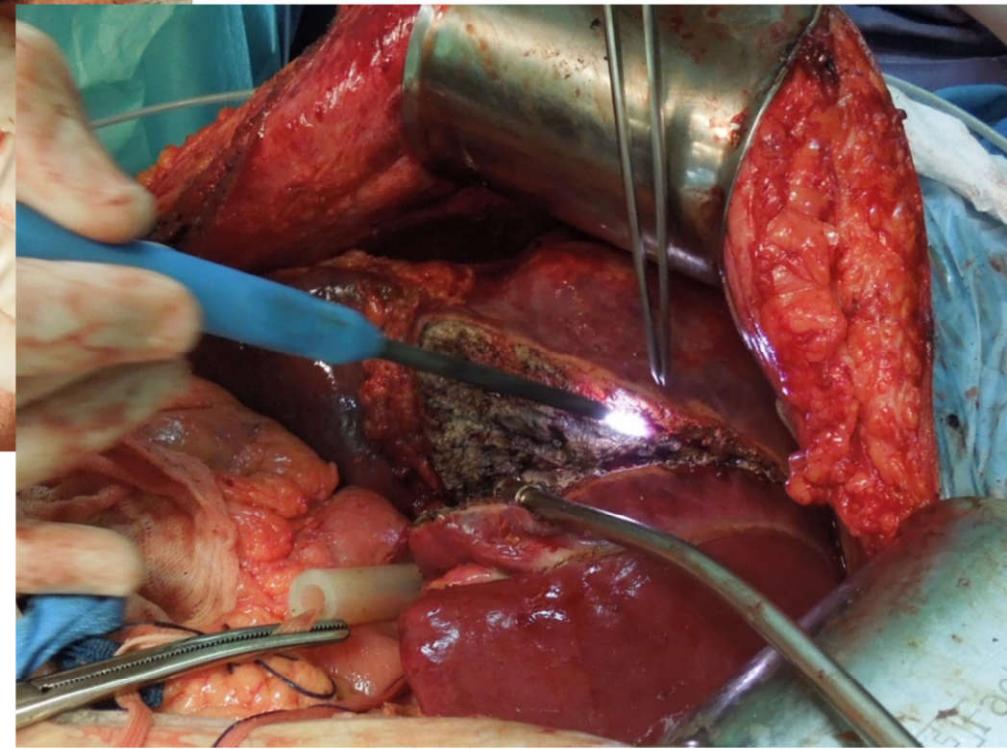
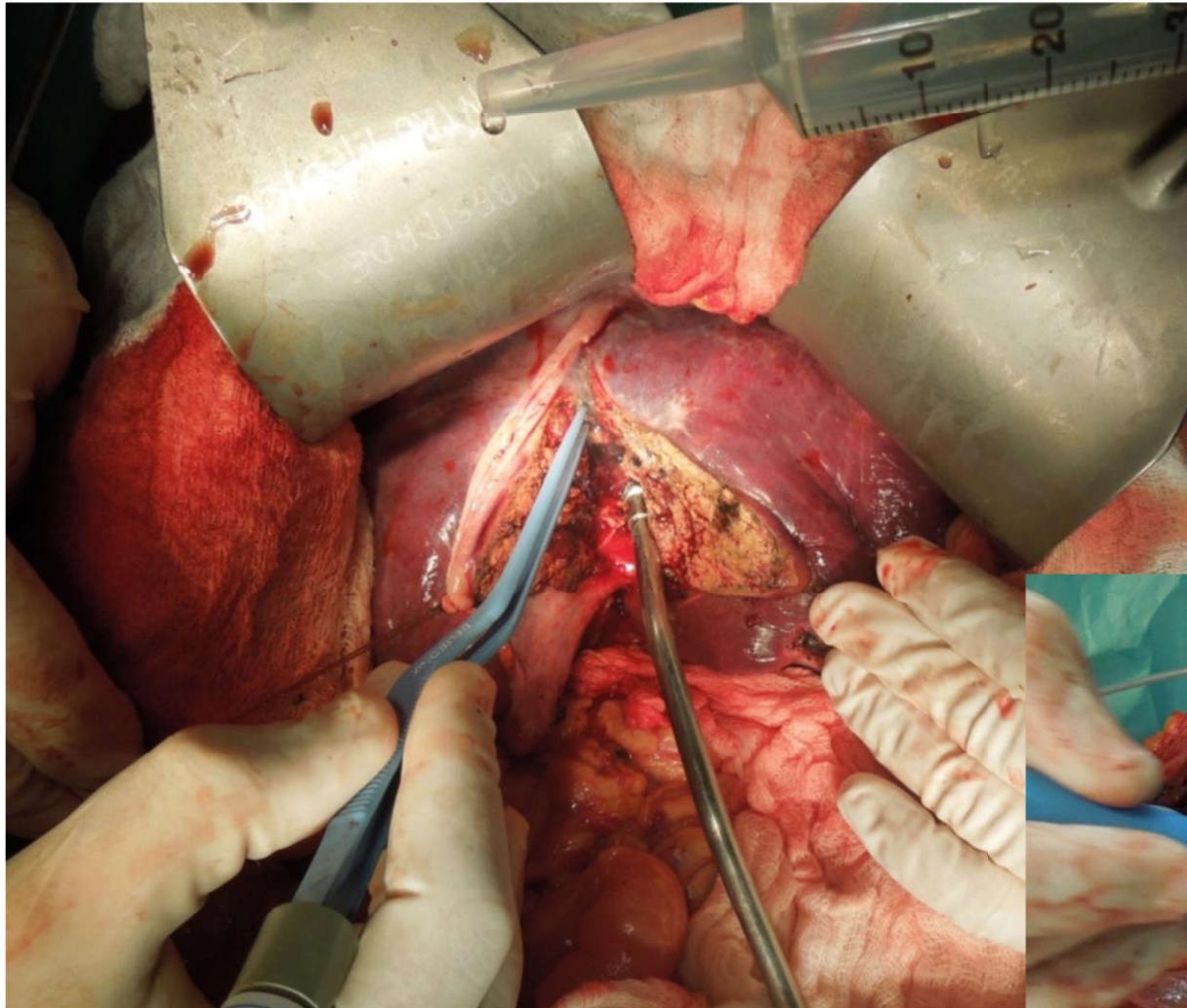




**REMANESCENTE HEPÁTICO  $\leq 30\%$**   
**( $\leq 0,5\%$  do peso corporal)**

## Remanente hepático





# Volumetria

SI:3

Acc#: 0367714803

Pos. do paciente: FFS

Desc. do estudo: ANGIO ABDOME

Desc. da série: web 3D vms

< 1002 - 3 web 3D vms >

Hepatic Vessels

Portal Vessels

Current

12/10/14, 08:15:23

PHILIPS

RP

200 px

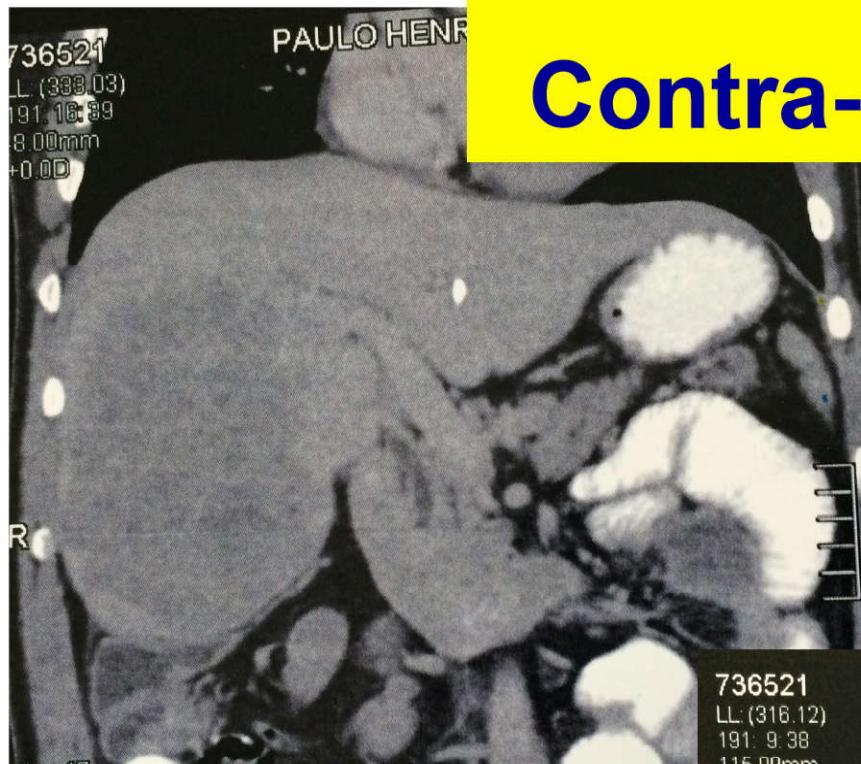
10 cm



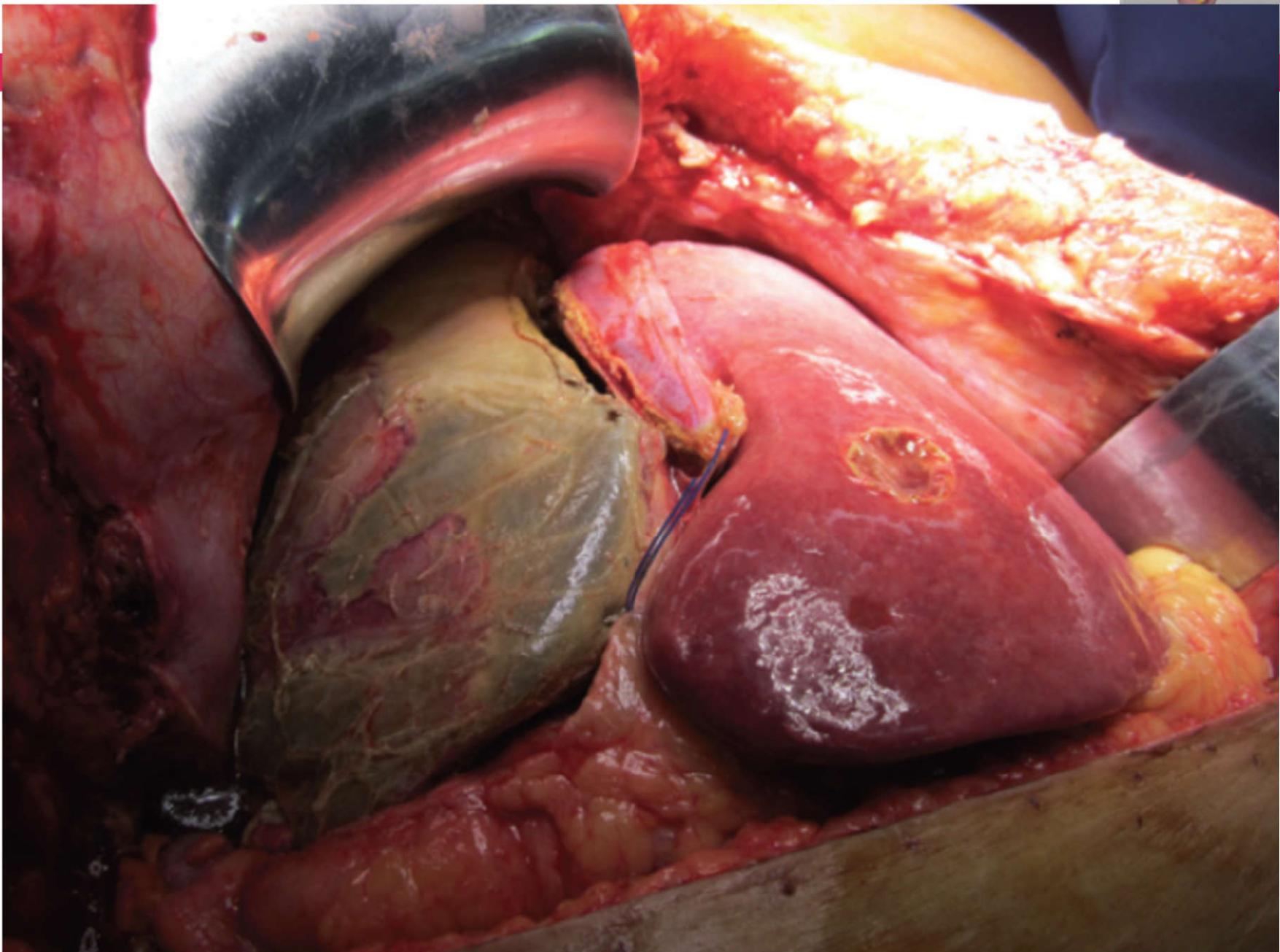
Liver Volume: 1404.0 cc  
Average CT#: 133.1 H.U.

# DOENÇA BILOBAR

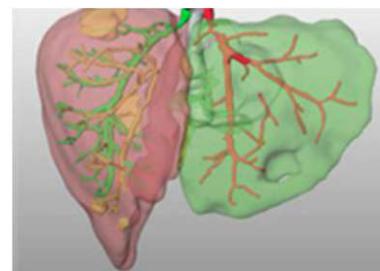
## Contra-indicação para EVP



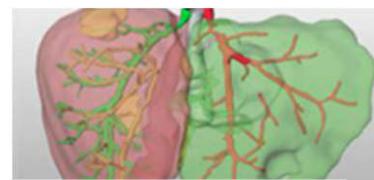
# Necessidade de grande hipertrofia (> 65%)



# Evitar em Klatskin e CHC



# Serviço de referência em HPB



J Gastrointest Canc  
DOI 10.1007/s12029-015-9691-6

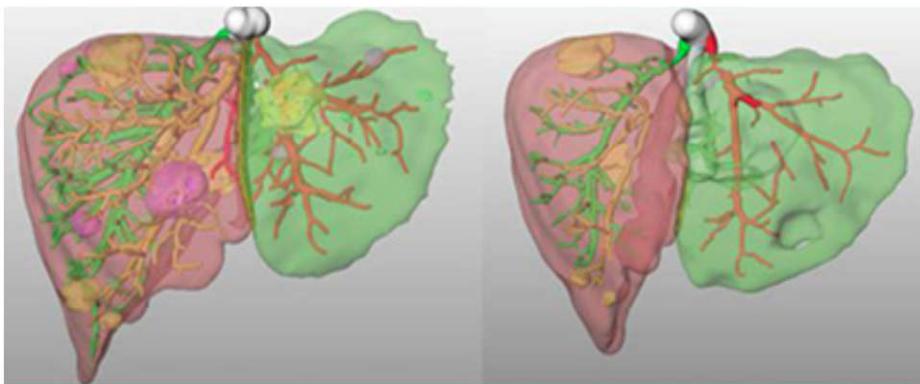
MGMT. OF COMPLEX CASES IN GI ONCOLOGY

## High Mortality Rates After ALPPS: the Devil Is the Indication

Paulo Herman · Jaime Arthur Pirola Krüger ·  
Marcos Vinícius Perini · Fabrício Ferreira Coelho ·  
Ivan Ceconello

**Table 1** Operative results

	Gender, age, date of first OR	Diagnosis	Indication for ALPPS	Time between first and second OR (days)	Time from second OR to discharge (days)	Complications	FLR hypertrophy (%)
Case 1	M 48 17/11/11	MCRC	Multiple mets and small FLR	7	20	Liver failure Pulmonary sepsis	81
Case 2	M 58 16/02/12	MCRC	Multiple mets and intraoperative decision	7	6	None	78
Case 3	M 58 23/05/12	iCCC	Proximity to the hepatic vein and small FLR	7	8	None	82
Case 4	M 58 07/11/12	MCRC	Multiple mets and small FLR	7	7	None	75
Case 5	F 38 10/04/13	MCRC	Multiple mets and small FLR	7	7		67
Case 6	M 52 17/06/13	MCRC	Multiple mets and small FLR	8	30	Biliary fistula Hepatic insufficiency	37
Case 7	F 55 15/11/13	MCRC	Multiple mets and small FLR	14	8	None	61



# 1 st International Consensus Meeting on ALPPS

February 27<sup>th</sup> and 28<sup>th</sup> 2015, Hamburg, Germany



**IHPBA 2016 · SÃO PAULO**  
12<sup>TH</sup> WORLD CONGRESS OF THE INTERNATIONAL  
**Hepato-Pancreato-Biliary Association**  
April 20-23 2016 - Brazil  
SHERATON WTC - SÃO PAULO

Obrigado!