

Living Donor Liver Transplant: 20 year experience lots of challenges / lots of modifications

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History of Liver Transplantation

- **1963:** 1st Liver Transplantation (starzl)
- **1967:** 1st successful Liver Transplantation (starzl)
- **1979:** 1st use of cyclosporine in liver transplantation (Calne)
- **1983:** Liver Transplantation approved as a valid therapy for ESLD (NIH)
- **1984:** reduced liver transplantation (Bismuth)
- **1988:** 1st Split Liver Transplantation (Pichlmayr's team in Hannover)
- **1989:** 1 and 5 year survival 70 and 64% (starzl)
- **1989:** First successful living-related liver transplant



Liver Transplantation Period

N = 169,810 (1968-June 2020)



History of living donor liver transplantation

- **1989:** pediatric LDLT
- **1993:** Adult LDLT using left lobe
- **1996:** Adult LDLT using right lobe
 - 1997: 1st successful in Asia (Asan – Korea)
 - 1998: 1st successful in Japan (Koyoto) and Europe (Essen)
 - 1998: 1st successful in US (Colorado university North America)
 - 2001: 1st successful in Egypt
- **1999:** Adult LDLT using right lobe in urgent case (fulminant failure)
- **2000:** Adult LDLT using dual graft (2left or left and right)
- **2001:** 1st successful Adult LDLT using dual graft (2left or left and right)
- **2008:** ABO incompatible adult LDLT



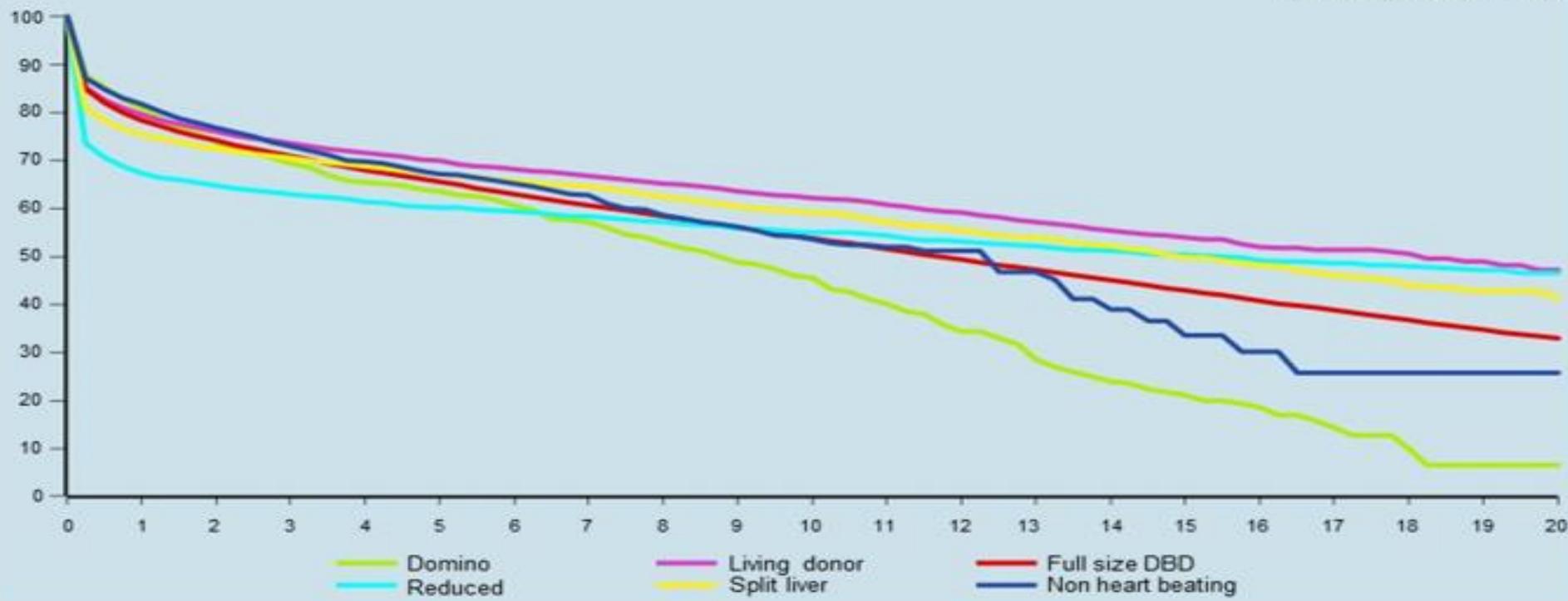
Graft Survival vs Type of Graft

N = 158,612 (1988-June 2020)

Global Log Rank p = <0.0001

Details : Logrank p

		proba
Dom.	Liv.	<0.0001
Dom.	FS DBD	<0.0001
Dom.	Red.	0.001
Dom.	Spl.	<0.0001
Dom.	NHB	0.0004
Liv.	FS DBD	<0.0001
Liv.	Red.	<0.0001
Liv.	Spl.	<0.0001
Liv.	NHB	0.035
FS DBD	Red.	0.12
FS DBD	Spl.	<0.0001
FS DBD	NHB	0.018
Red.	Spl.	0.003
Red.	NHB	<0.0001
Spl.	NHB	0.098



Survival %

Type of liver graft	1 yr	3 yrs	5 yrs	8 yrs	10 yrs	12 yrs	14 yrs	16 yrs	18 yrs	20 yrs
Domino	81%	69%	64%	53%	46%	34%	24%	19%	10%	7%
Living donor	80%	74%	70%	65%	62%	59%	55%	52%	51%	47%
Full size DBD	78%	71%	66%	58%	54%	49%	45%	41%	37%	33%
Reduced	67%	63%	60%	57%	55%	53%	51%	49%	48%	47%
Split liver	75%	71%	67%	62%	59%	55%	52%	48%	44%	41%
Non heart beating	82%	73%	67%	59%	54%	51%	39%	30%	26%	26%

Number of exposed patients

	Total	1 yr	3 yrs	5 yrs	8 yrs	10 yrs	12 yrs	14 yrs	16 yrs	18 yrs	20 yrs
Domino	1017	747	561	465	266	191	101	47	24	3	0
Living donor	10220	5252	3345	2407	1419	960	637	410	244	111	40
Full size DBD	133323	92474	70678	56126	39375	30464	23281	17334	12421	8464	5522
Reduced	1749	1115	940	816	687	607	524	435	344	254	173
Split liver	8607	5608	4372	3459	2288	1660	1107	728	444	224	101
Non heart beating	3696	2360	1311	769	320	153	56	16	7	5	3

TABLE 1. Liver transplant activity in the Arab world until August 2013 arranged according to date of the first liver transplant

Country	First LT	LDLT	DDLT	Total	%
Saudi	1990	648	690	1,338	35%
Egypt	1991	2,138	2	2,140	56%
Tunisia	1998	8	31	39	1%
Lebanon	1998	4	19	23	0.6%
Algeria	2003	36	—	36	1%
Jordan	2004	174	4	178	5%
Libya	2005	21	—	21	0.5%
UAE	2007	2	—	2	0.1%
Kuwait	2010	—	2	2	0.1%
Iraq	2011	21	0	21	0.5%
Qatar	2011	—	4	4	0.1%
Total		3,052	752	3,804	

Agenda (Surgical Challenges and Possible Solutions)

Recipient

- Pre-operative
- Intra-operative

Donor

- Preoperative
- Intra-operative

Recipient

Modification

- Patient type and selection
- Operative
 - Hepatectomy
 - Implantation
- Unsolved problem

Goal

- Improving result
 - Good patient selection (without unnecessary restriction)
 - Decrease operative time
 - Decrease blood loss
 - Decrease incidence of vascular complication
- Treatment of more advanced and complicated cases

Donor

Modification

- Donor selection
- Operative

Goal

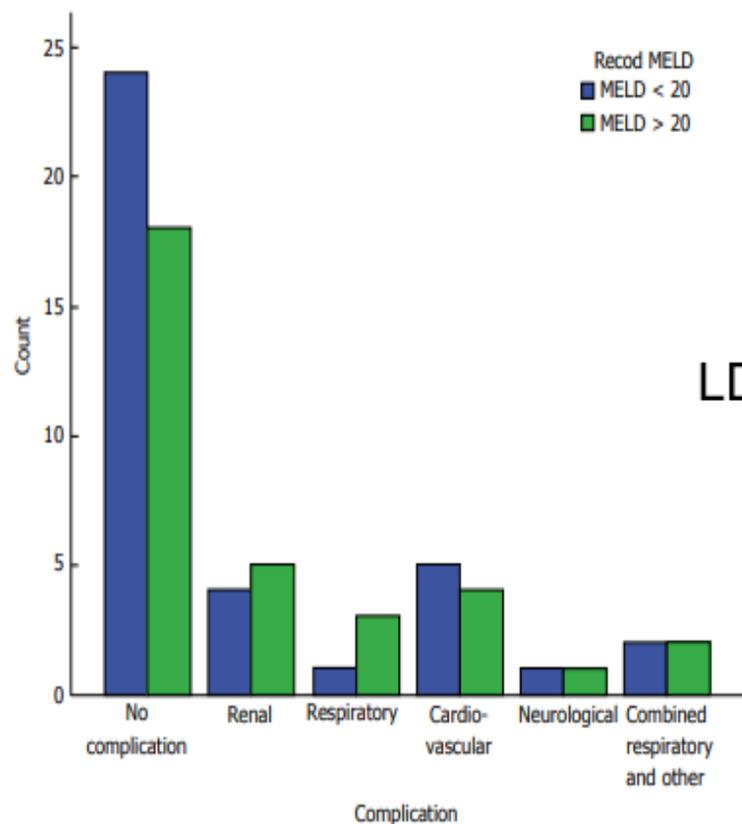
- Increase donor pool
- Donor safety

Selection (referral center)

- High MELD
- HCC beyond Milan
- Budd-chiari
- PVT (grade I – II)
- Combined liver – kidney
- salvage transplantation
- Retransplantation
- Domino liver transplantation
- Malignant PVT
- PVT (grade III – IV)

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LDLT is safe for Patients with high MELD score with good respiratory and renal reserve

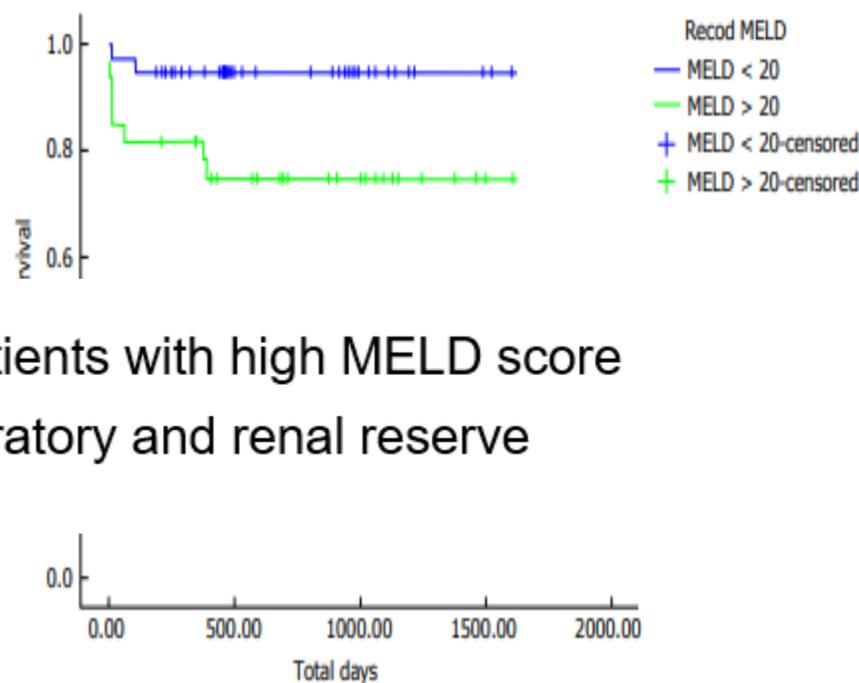
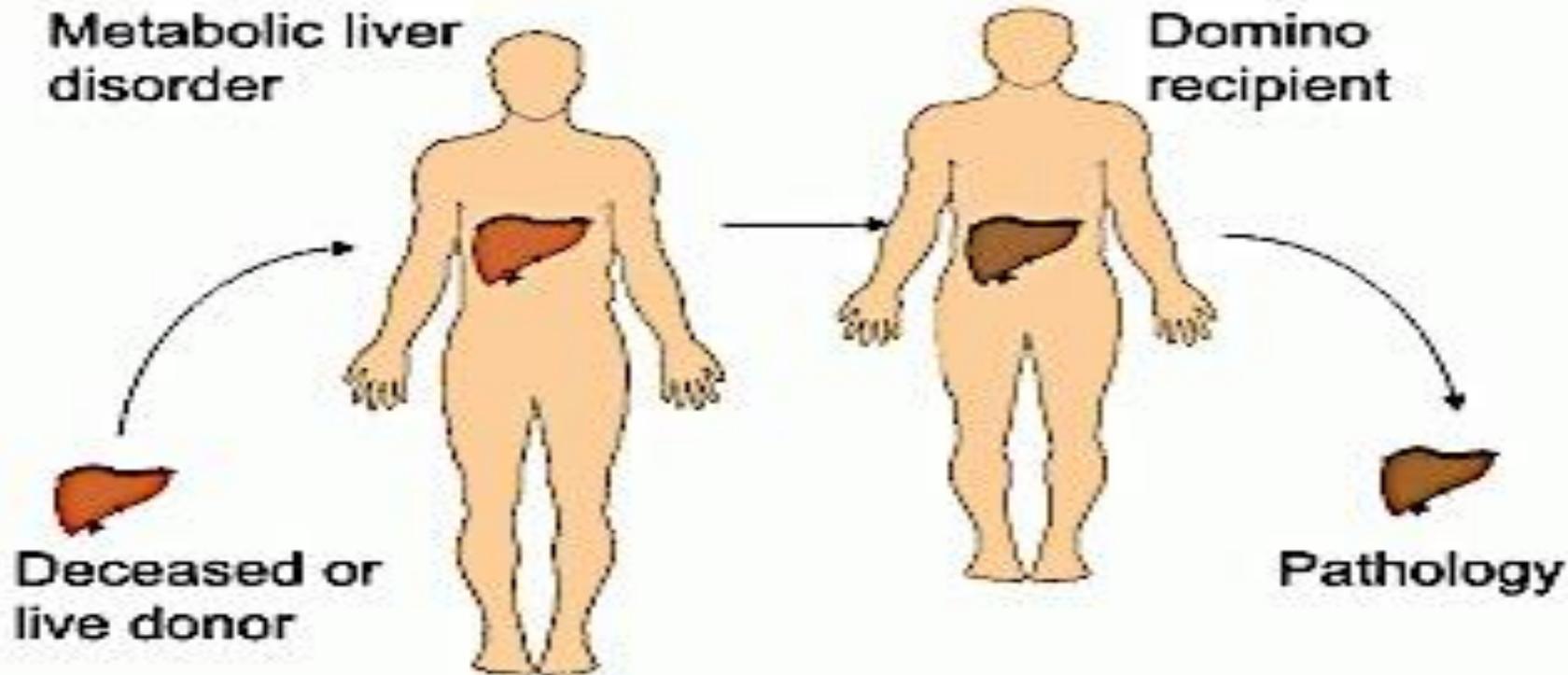


Figure 1 Kaplan-Meier curve for overall survival of both groups. The Group 1 patients that had a MELD score < 20 had higher overall survival rates than the Group 2 patients that had a MELD score > 20. MELD: Model for end-stage liver disease; Cum survival: Cumulative survival.

Selection (referral center)

- High MELD
- HCC beyond Milan
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- PVT (grade I – II)
- Combined liver – kidney
- salvage transplantation
- Retransplantation
- **Domino liver transplantation**
- Malignant PVT
- PVT (grade III – IV)

Domino liver transplantation – the Concept



- ◇ We did a domino between 27 y old male patient with familial hypercholesteremia Who received a liver from his twin sister and donate his own to a 52 y old female with LCF due to HCV

Selection (referral center)

- High MELD
- HCC beyond Milan
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LDLT

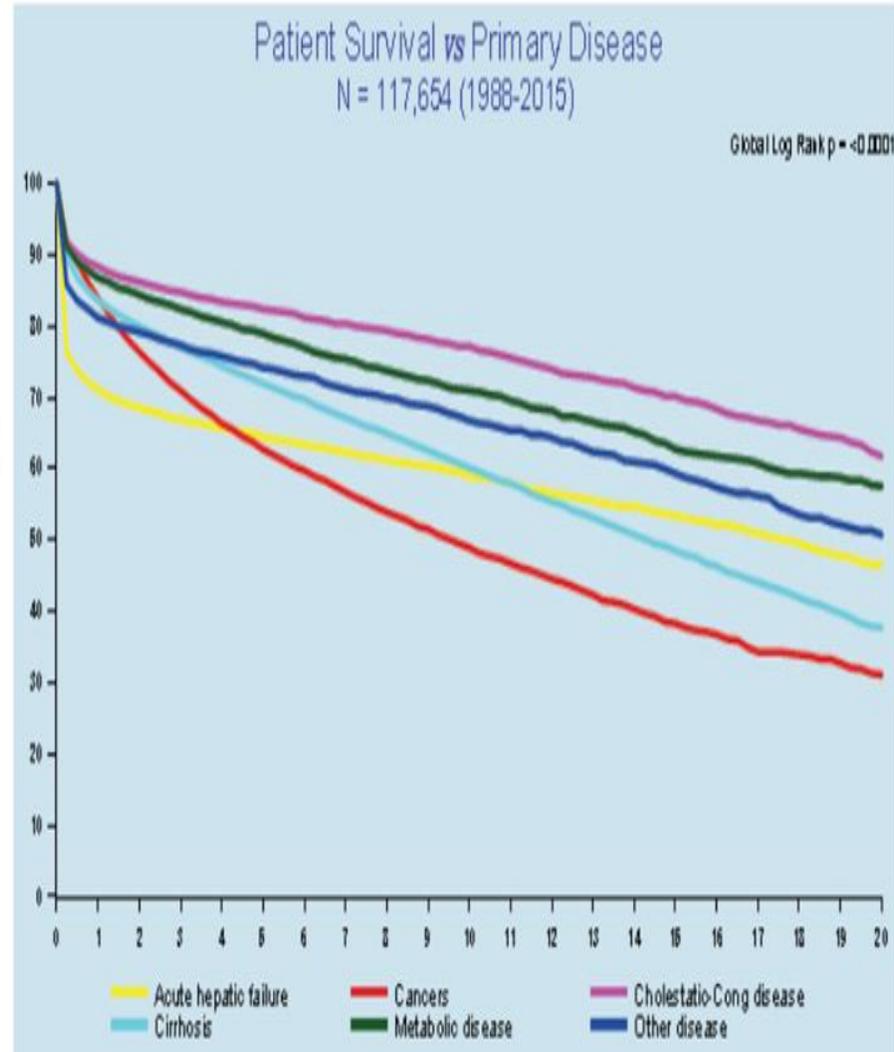
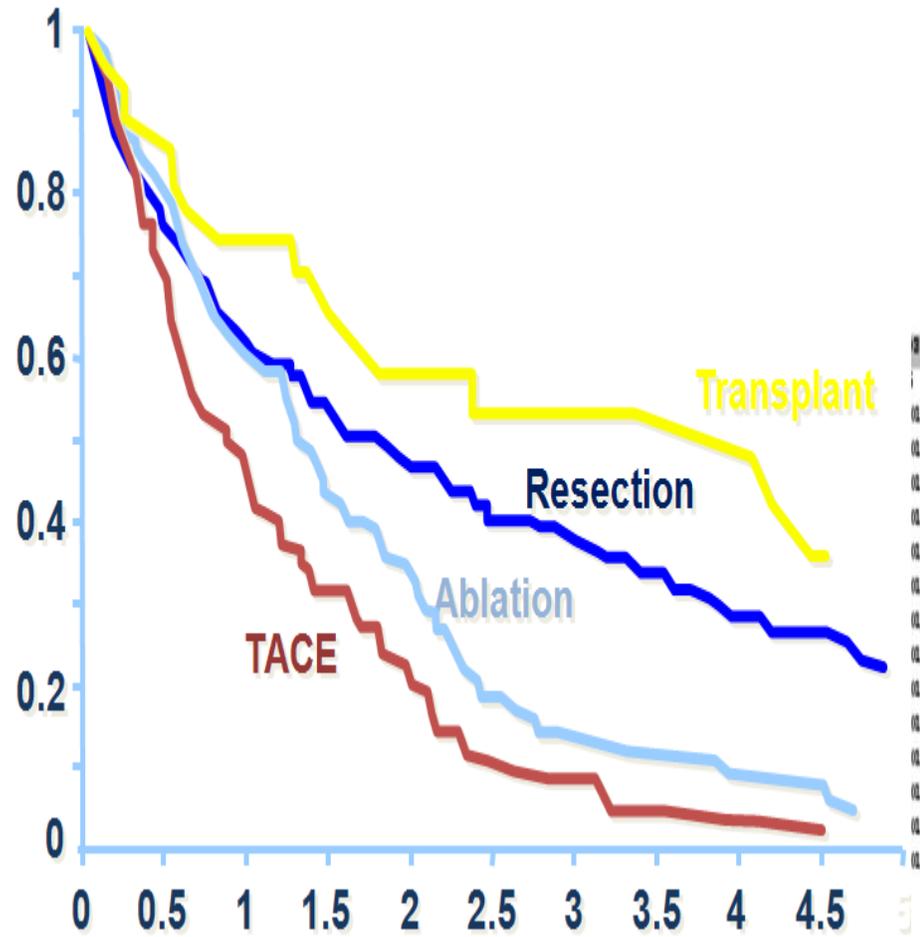
Best **Patient** Chance

Compare different treatment
modalities

DDLT

Best **Graft** Chance

compare between different
recipients



PVTT

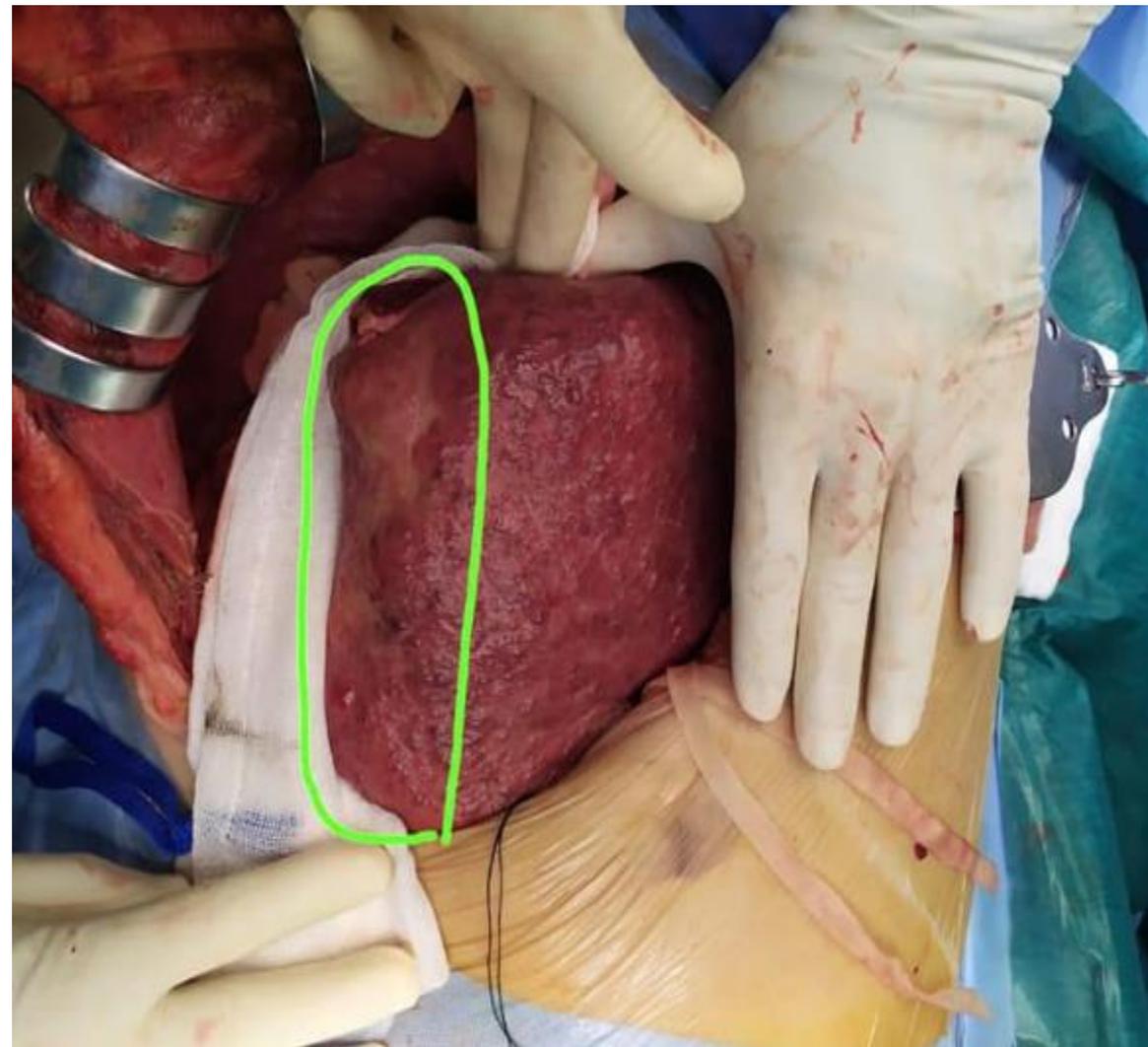
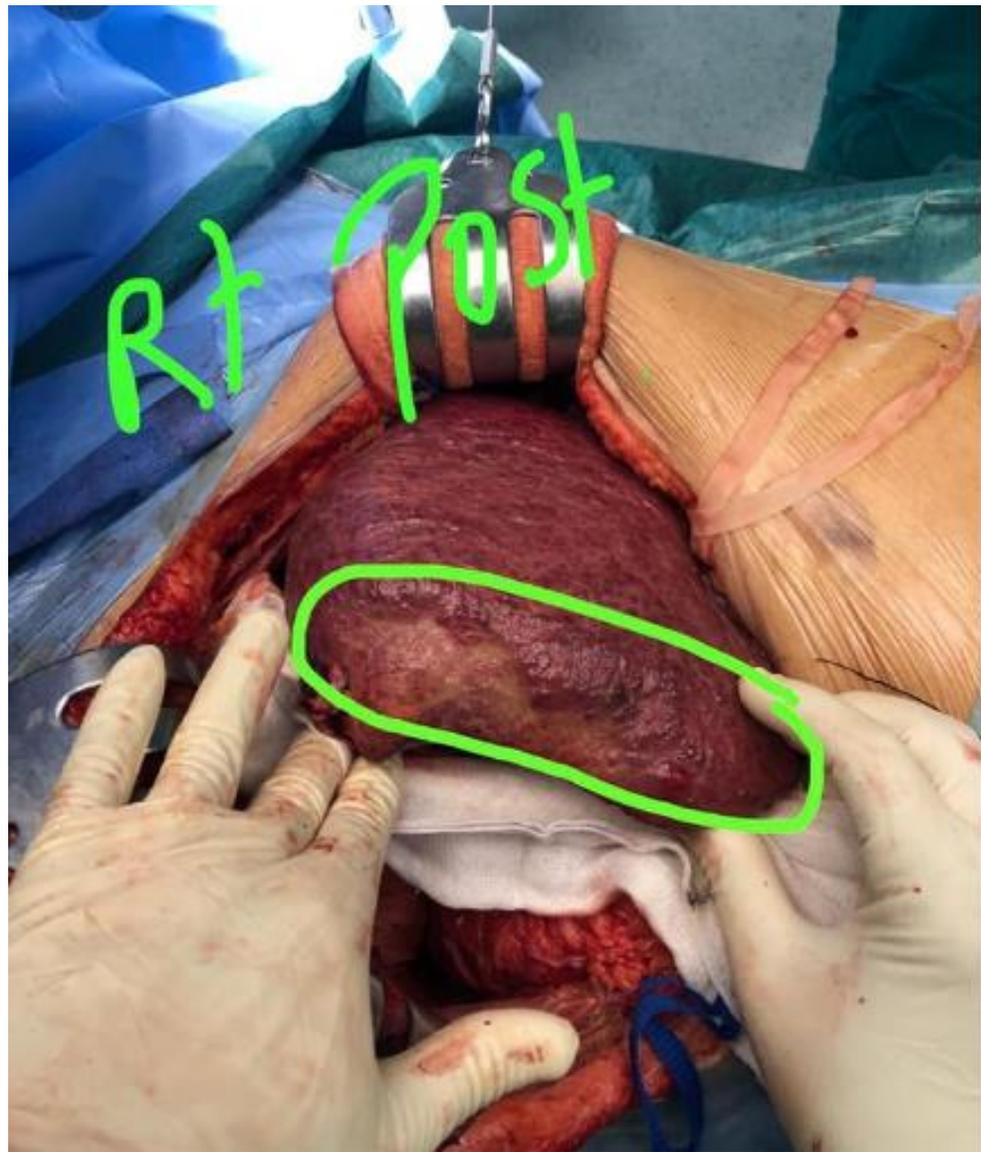
Sorafenib + TACE

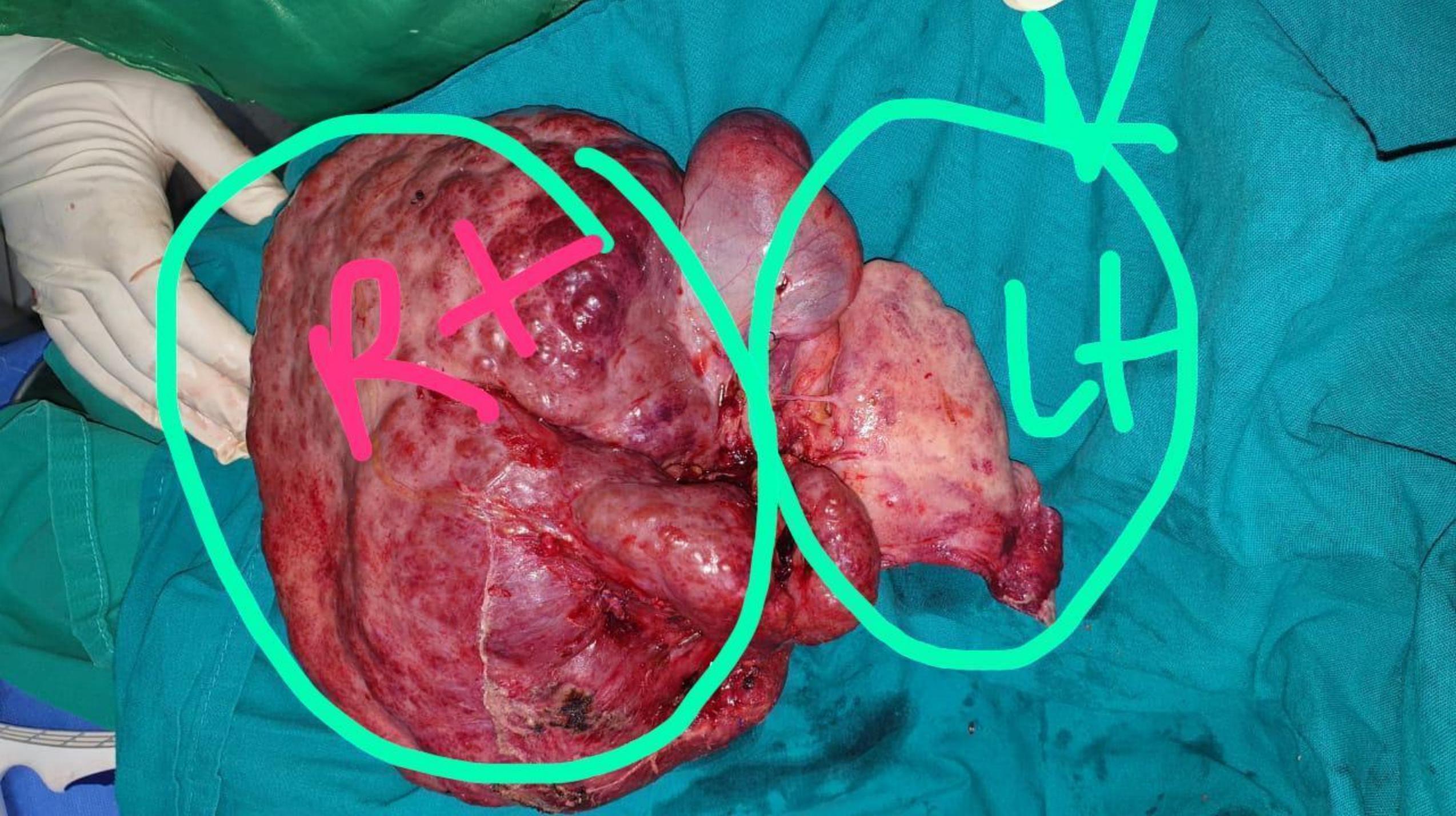
TACE + RF + sorafenib

TACE + PTPVS + 3DCRT



TARE  **LDLT**
(DFS 39mo)
Levi Sandri *et al*, 2017

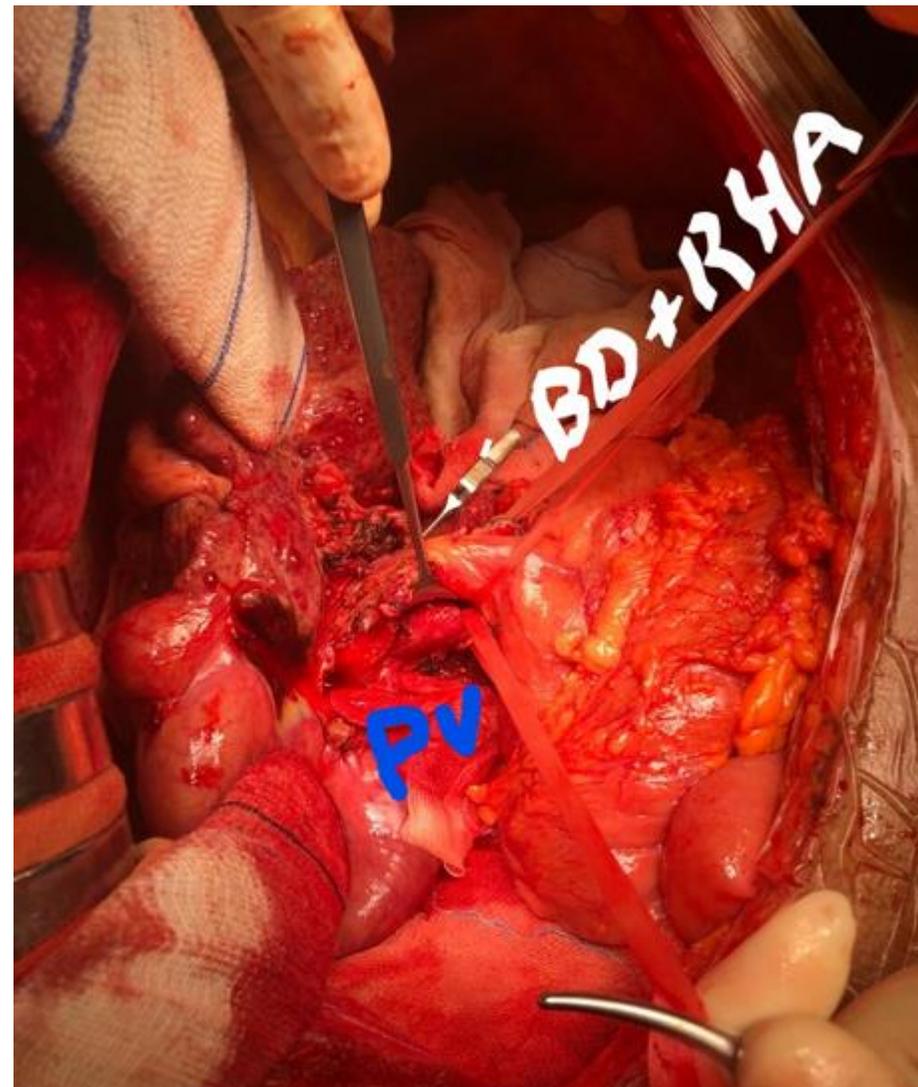
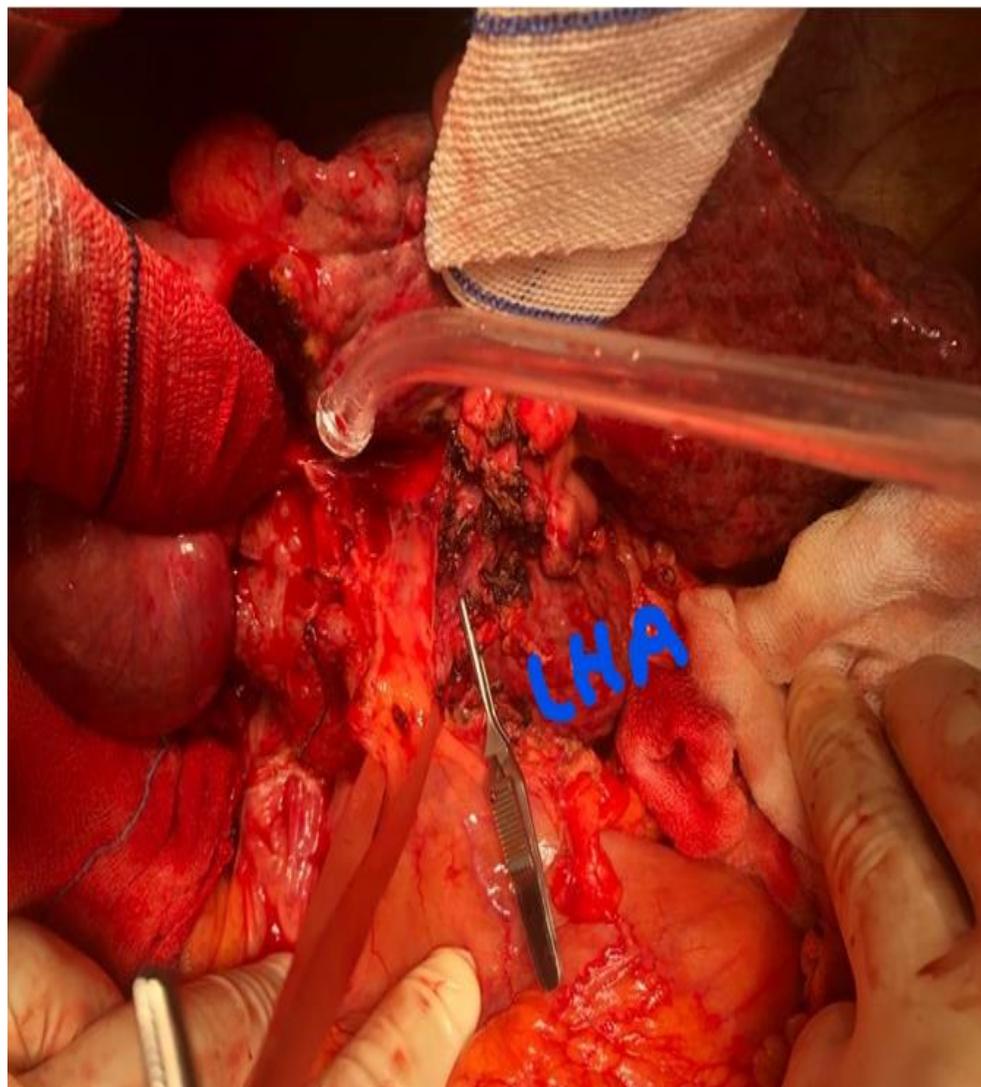




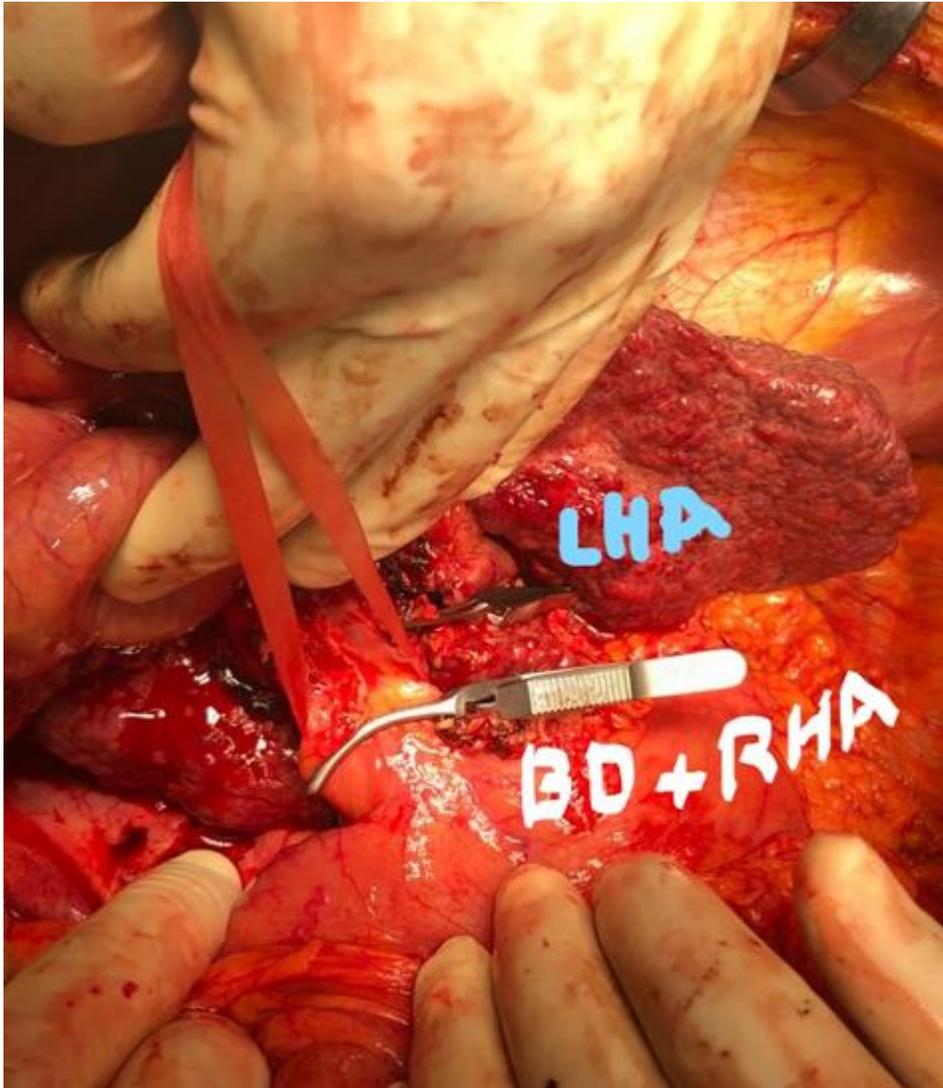
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Operative steps modification



Hepatic artery

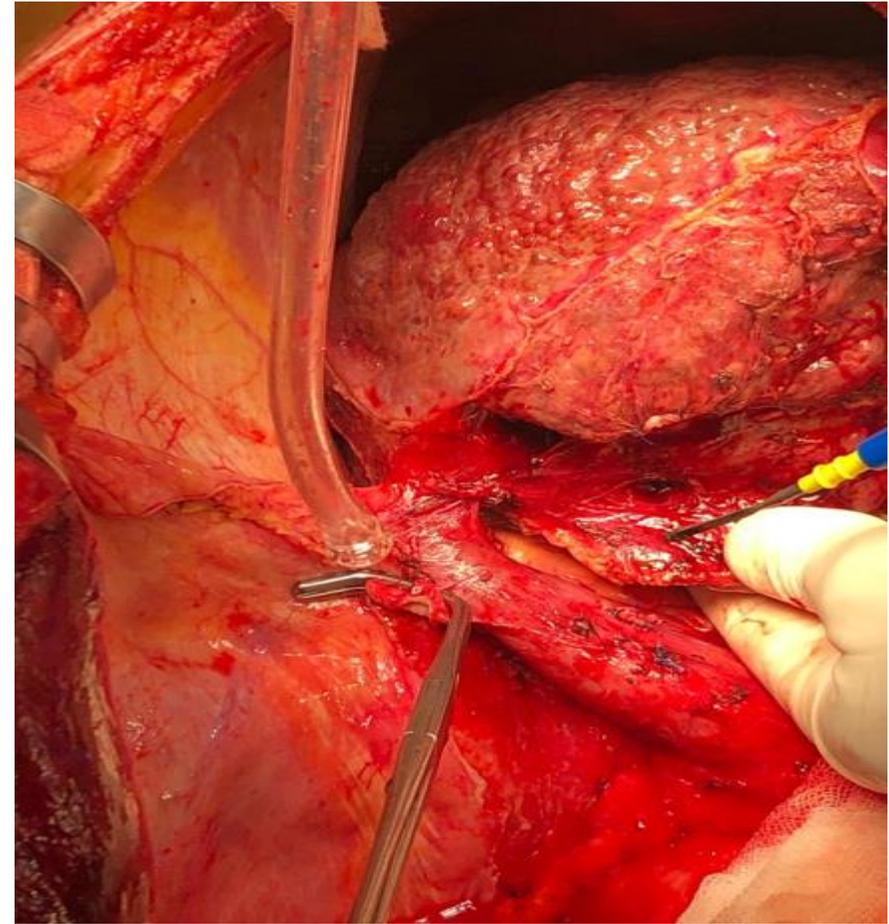
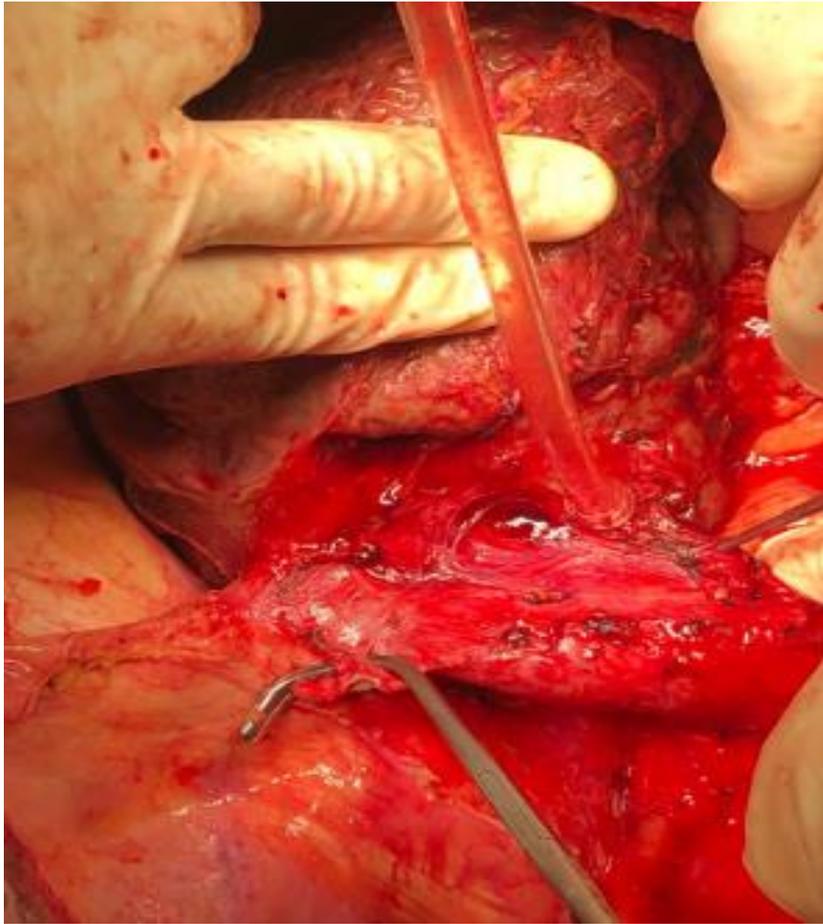


No more excessive dissection

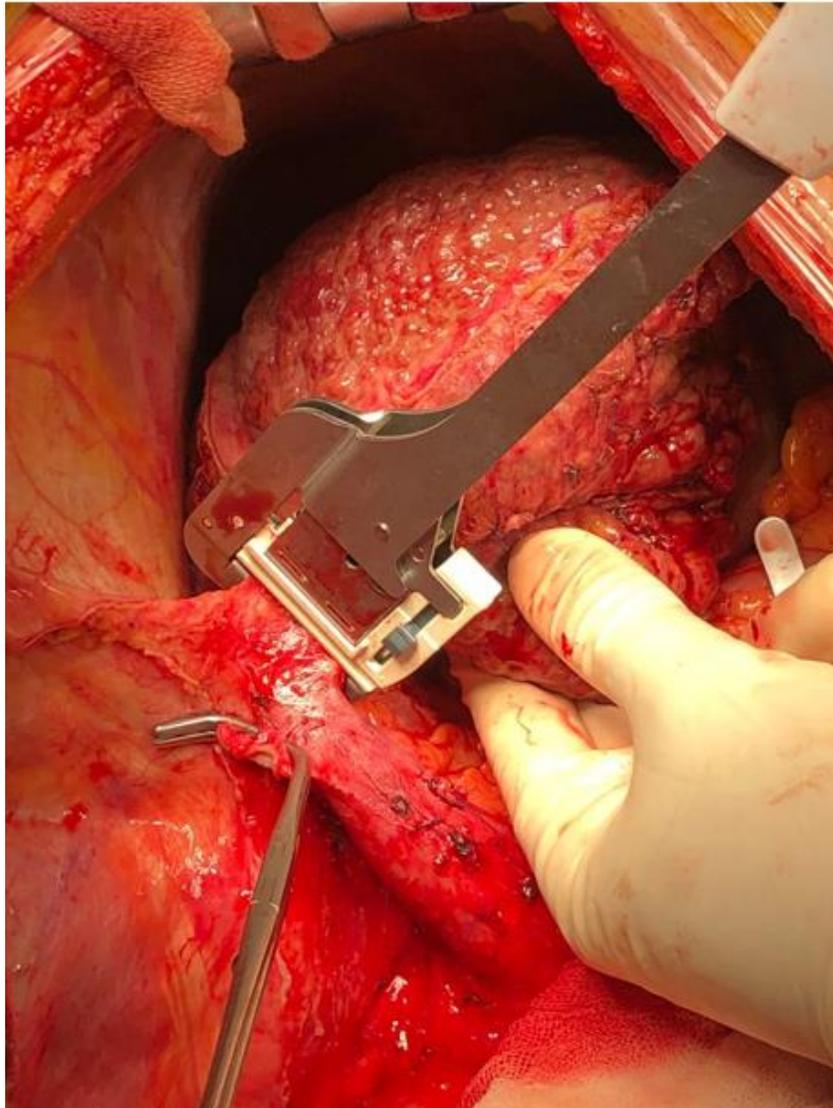
bulldog Vs ligation

better BD blood supply

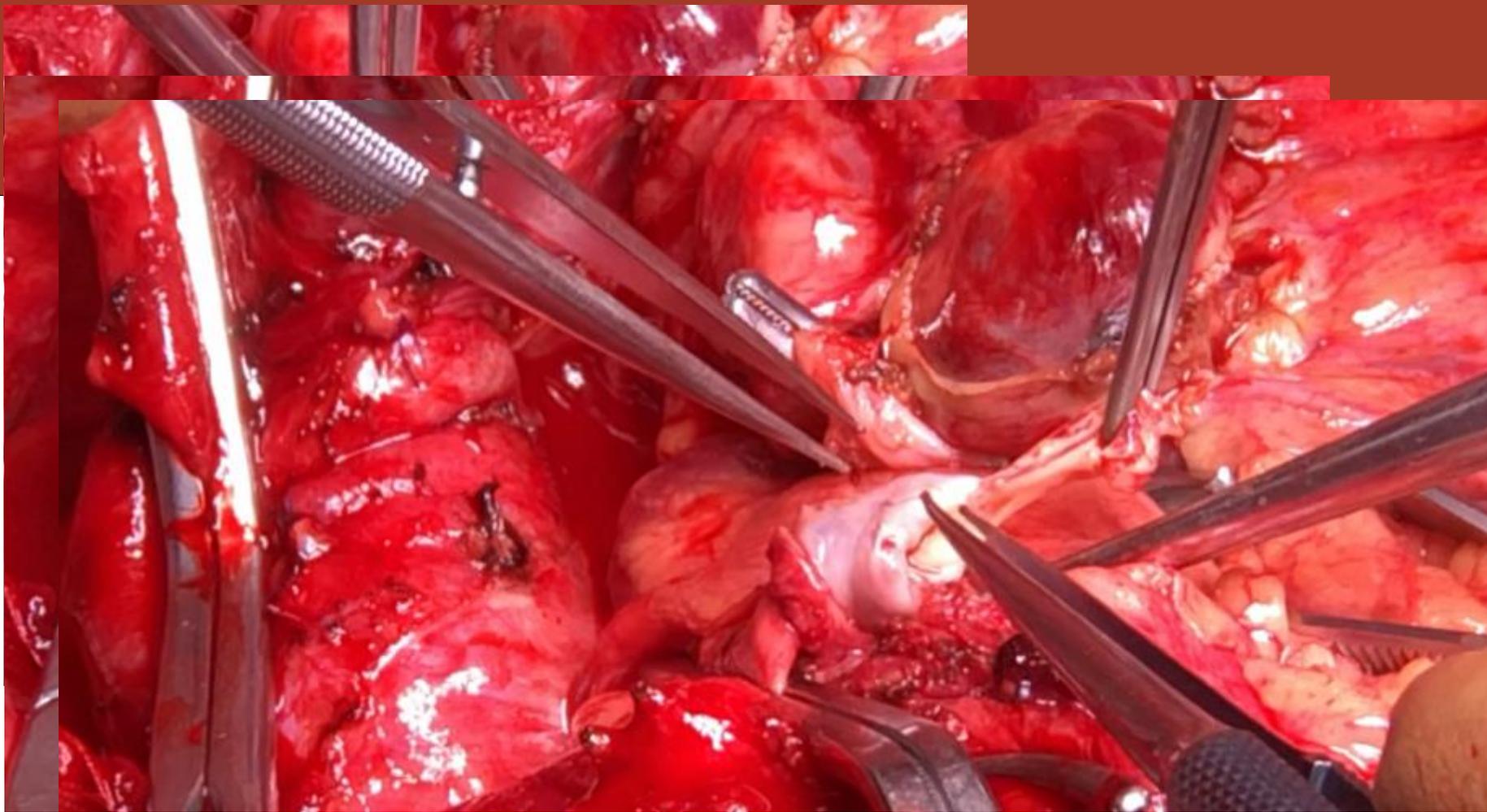
avoid arterial intimal dissection



segment I mobilization and piggy back after pedicle clamp
less time lower incidence of bleeding

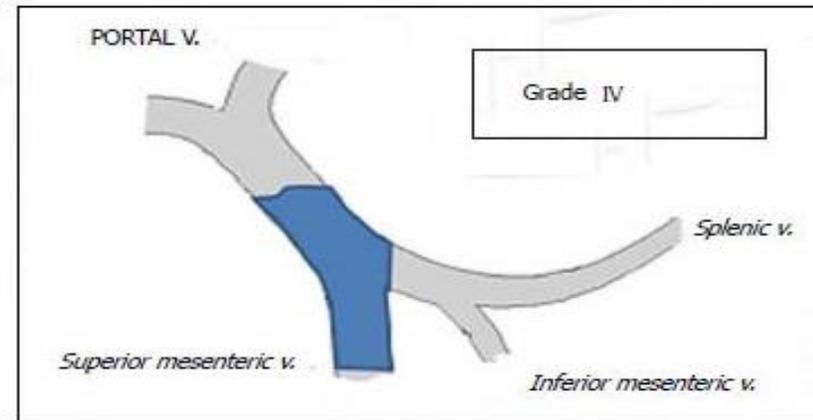
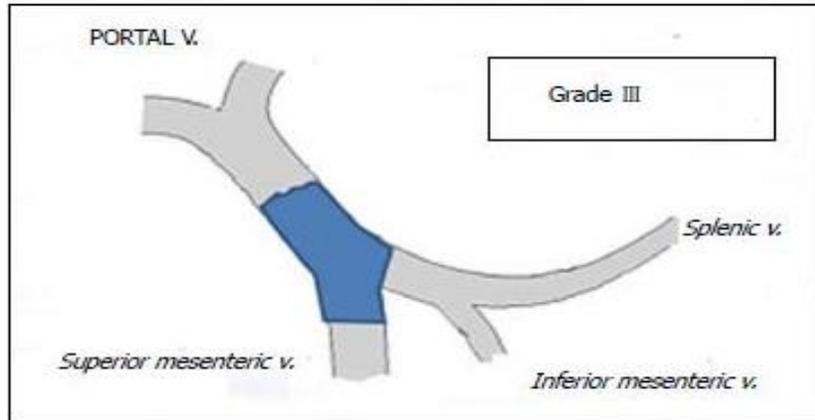
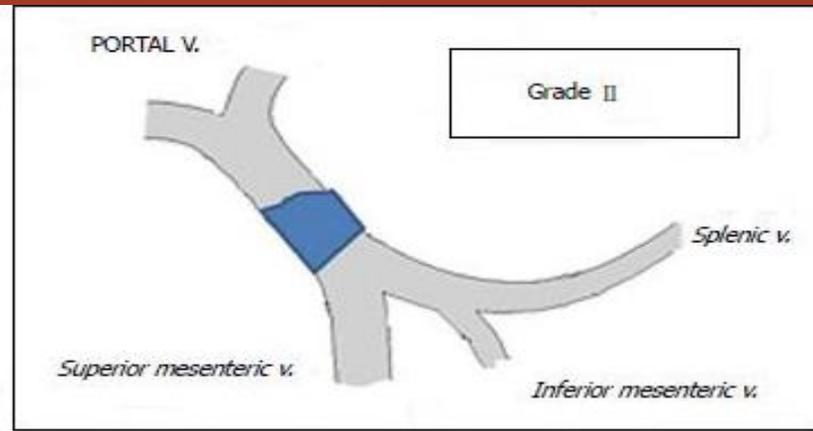
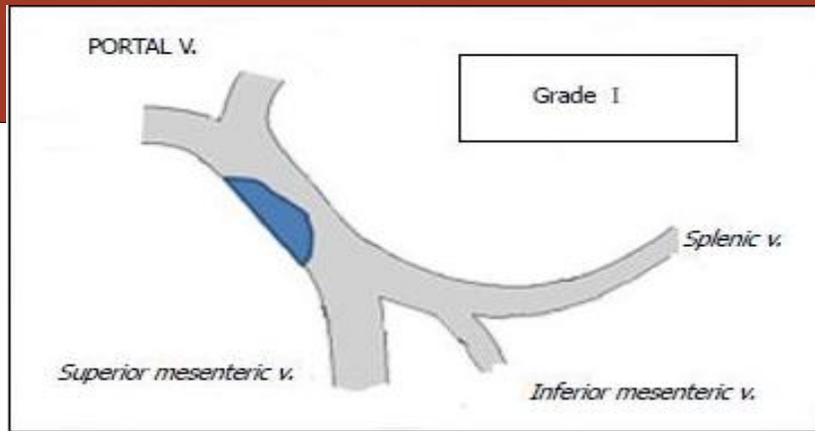


- **The more experience you get, the more you use the tools**



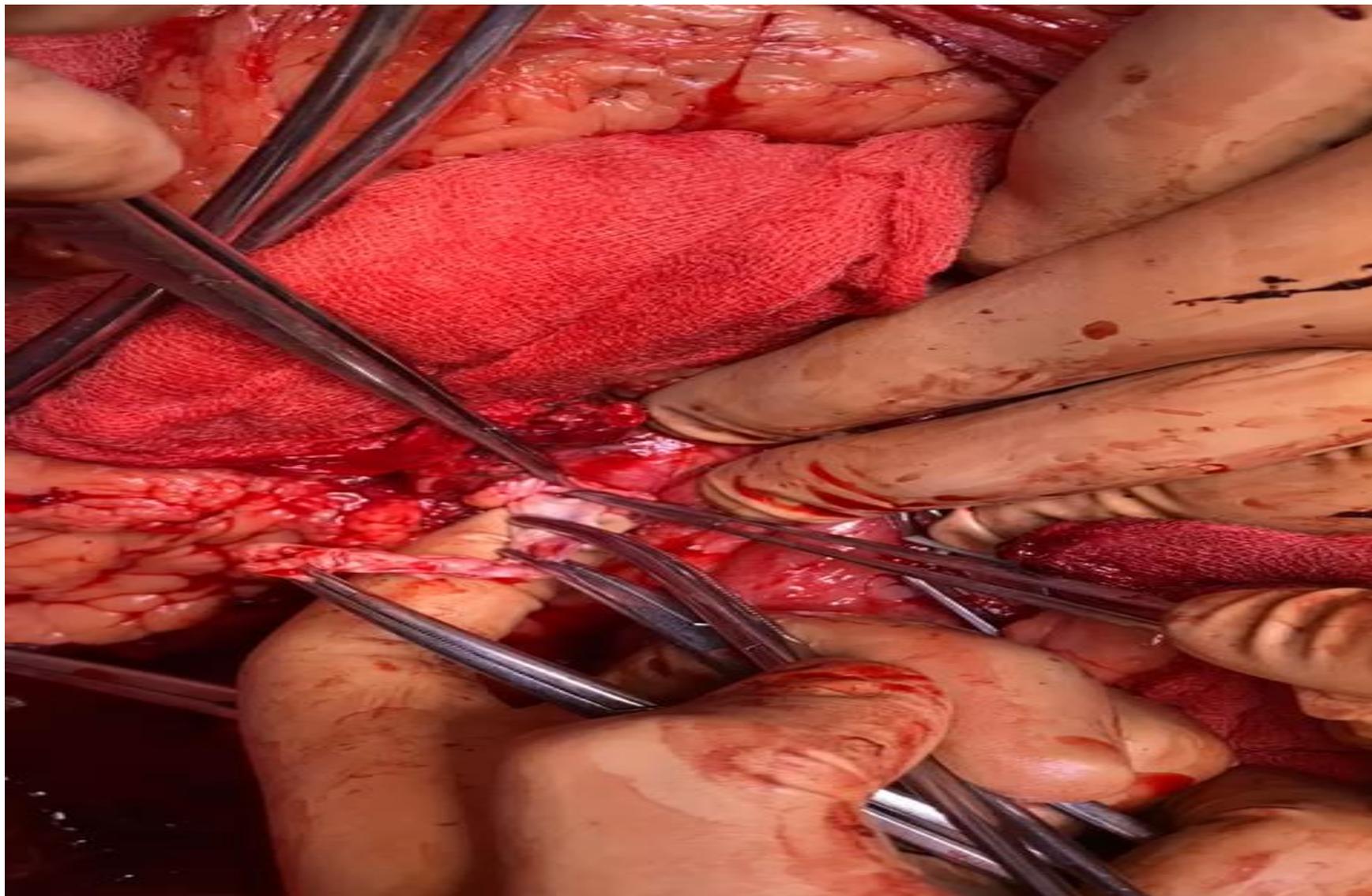
Venous involvement	Grade 1	Grade 2	Grade 3	Grade 4
PV	< 50%	> 50%	Complete	Complete
"Proximal" SMV	± Minimal	± Minimal	Complete	Complete
"Distal" SMV	None	None	None	Complete

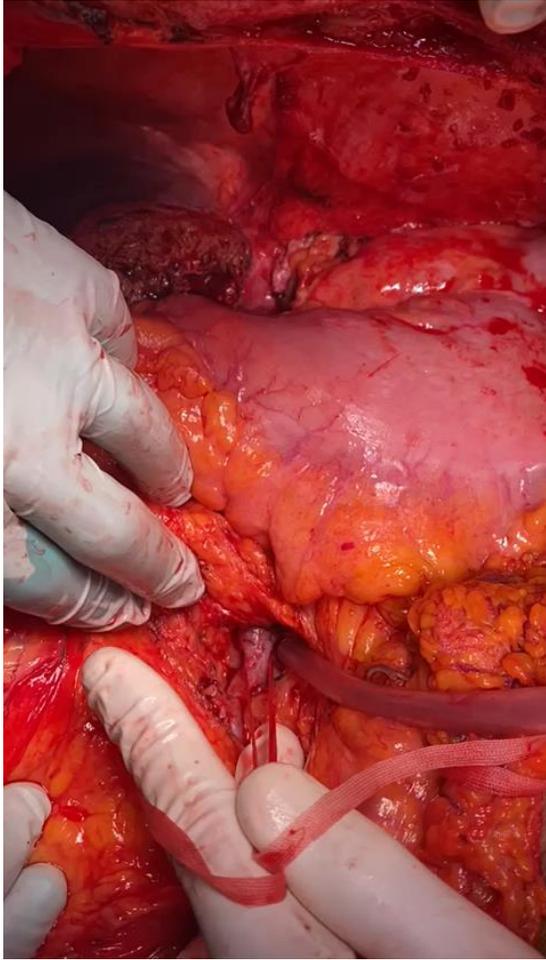
- Increase blood loss (cavernoma and collateral)
- Inadequate thrombectomy (grade III or IV)
- Weak flow post thrombectomy (steal phenomena)
 - Collateral ligation
 - Left renal vein ligation
 - I.O embolization for inaccessible collateral
- Arterial complication
- Biliary complication
- Need for early anticoagulation



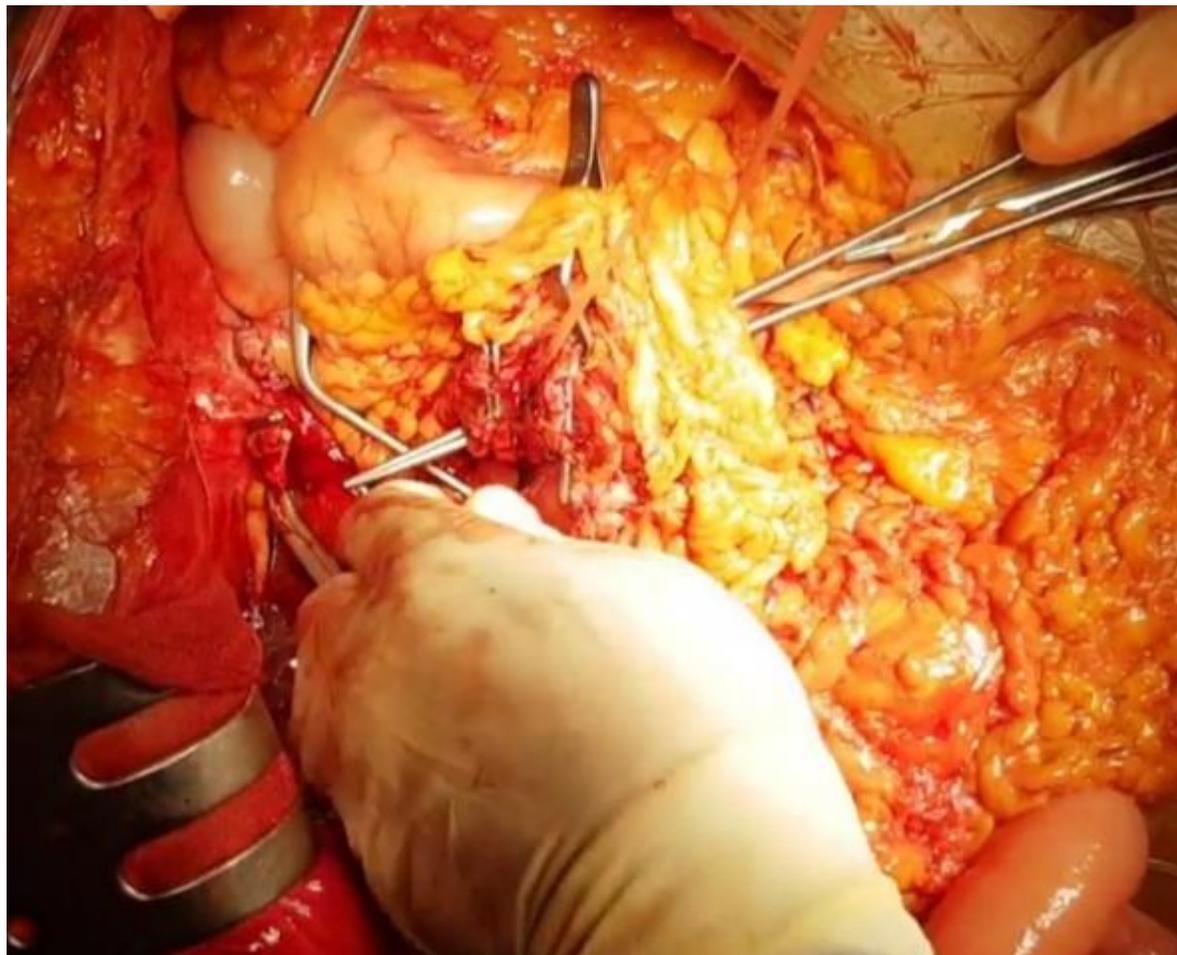
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Eversion thrombectomy





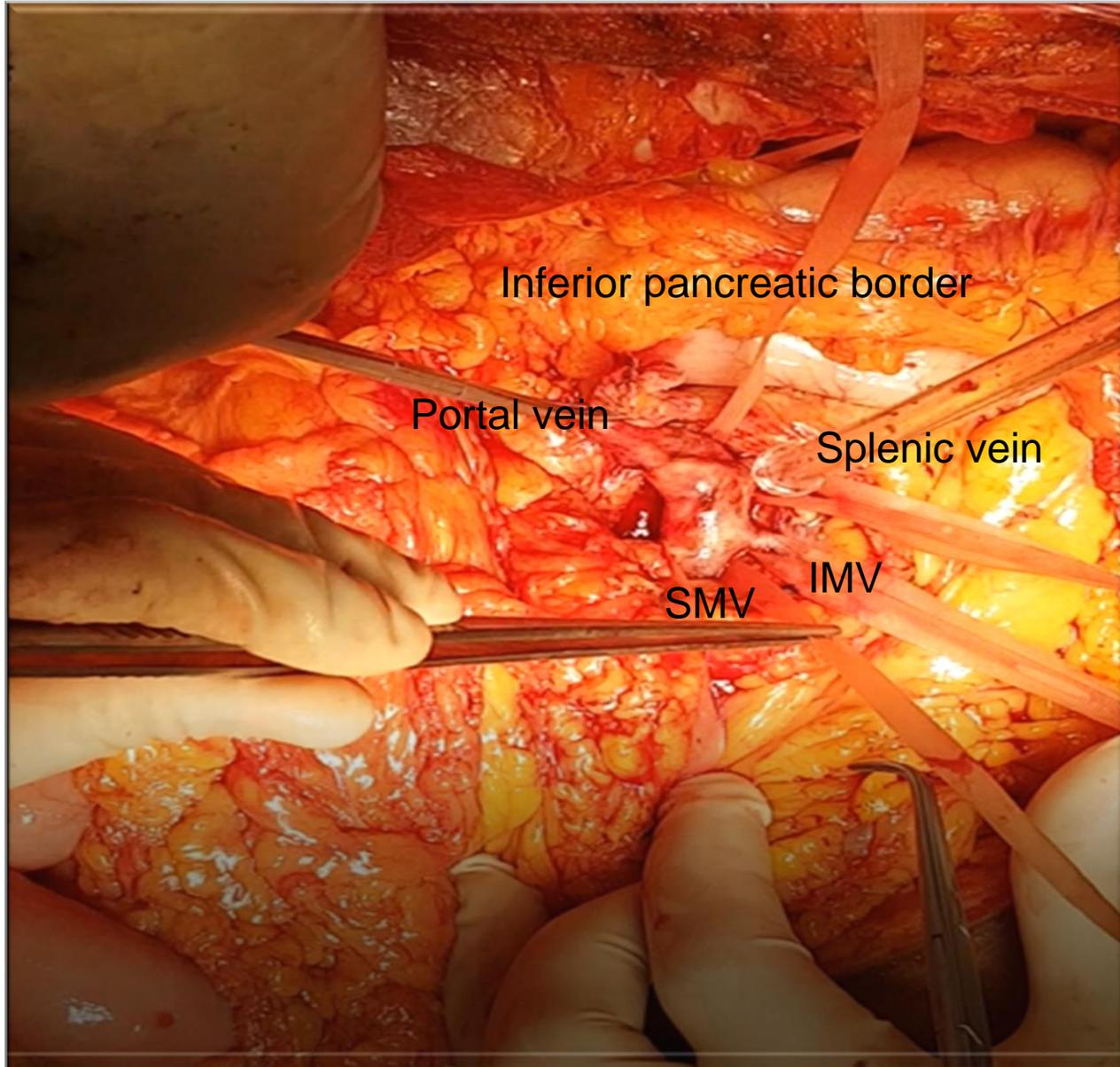
Novel technique for pediatric living donor liver transplantation in patients with portal vein obstruction: The “pullout technique”



da | Yoshihiro Hirata | Masahiro

- The pullout technique will be useful
 - if the native PV showed sclerotic small caliber
 - PV thrombus ex-tended to the SMV and SpV junction in preoperative imaging study.

The hypoplastic PV/PV thrombus could be completely removed by pulling out the PV from the superior border to the inferior border of the pancreas.



Donor liver transplantation The “pullout

| Yoshihiro Hirata | Masahiro

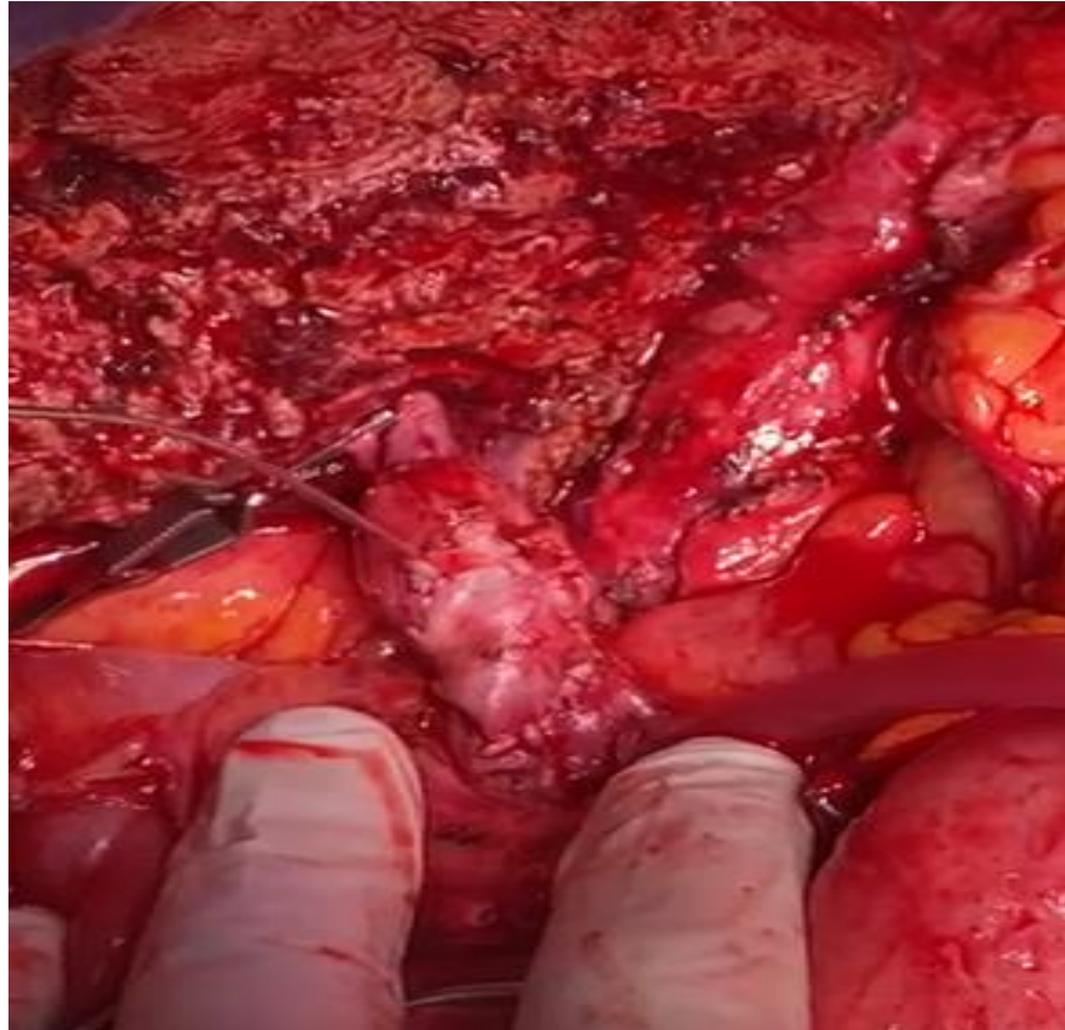
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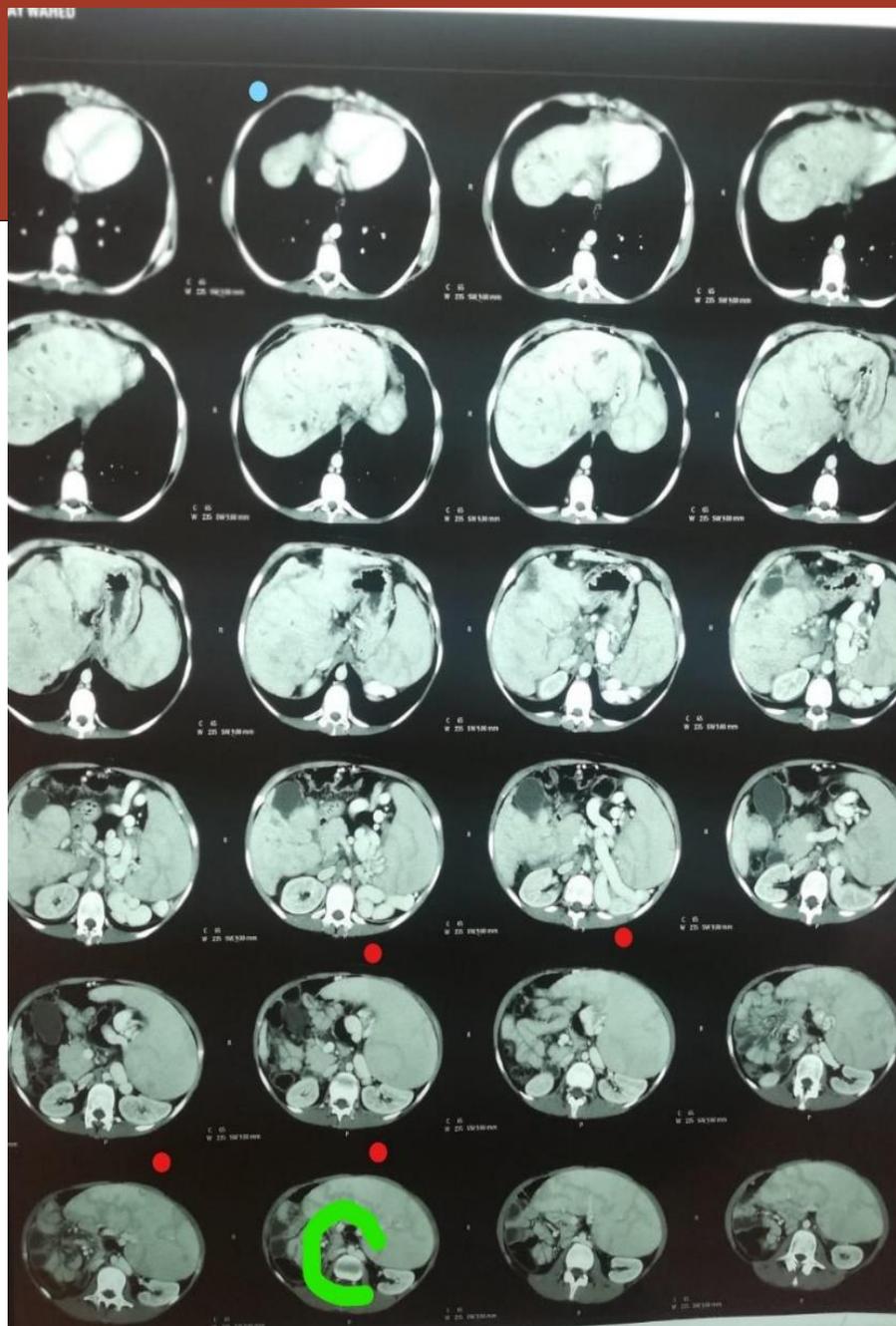
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Attenuated PV

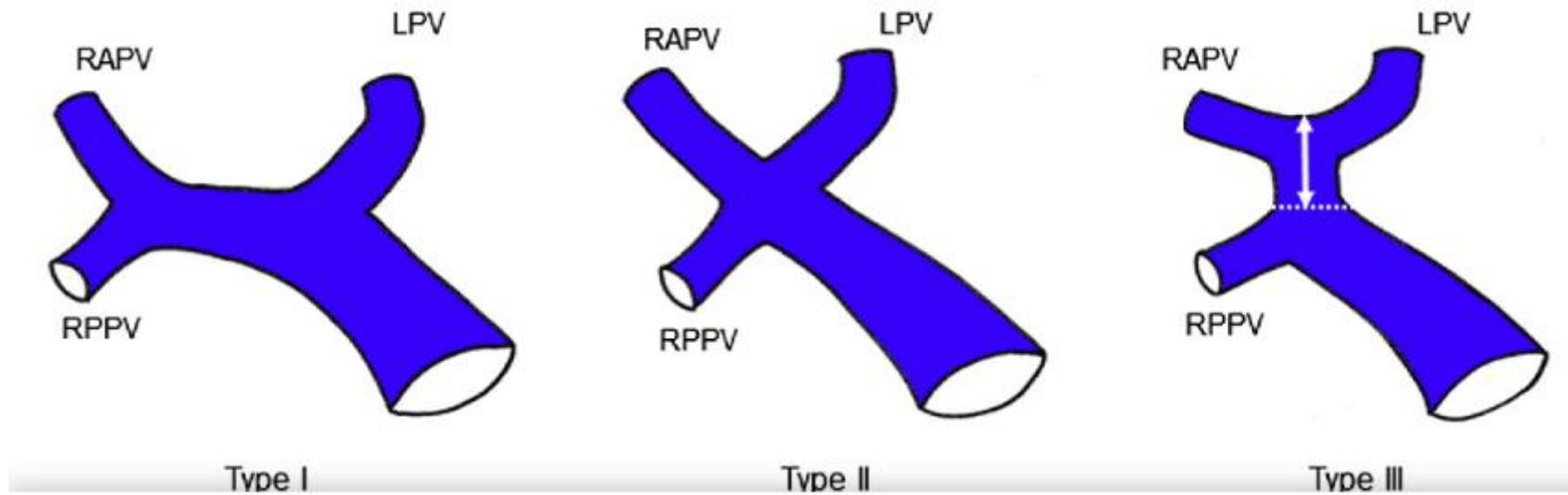
- Pathological
- Iatrogenic (after thrombectomy)

Vein patch graft

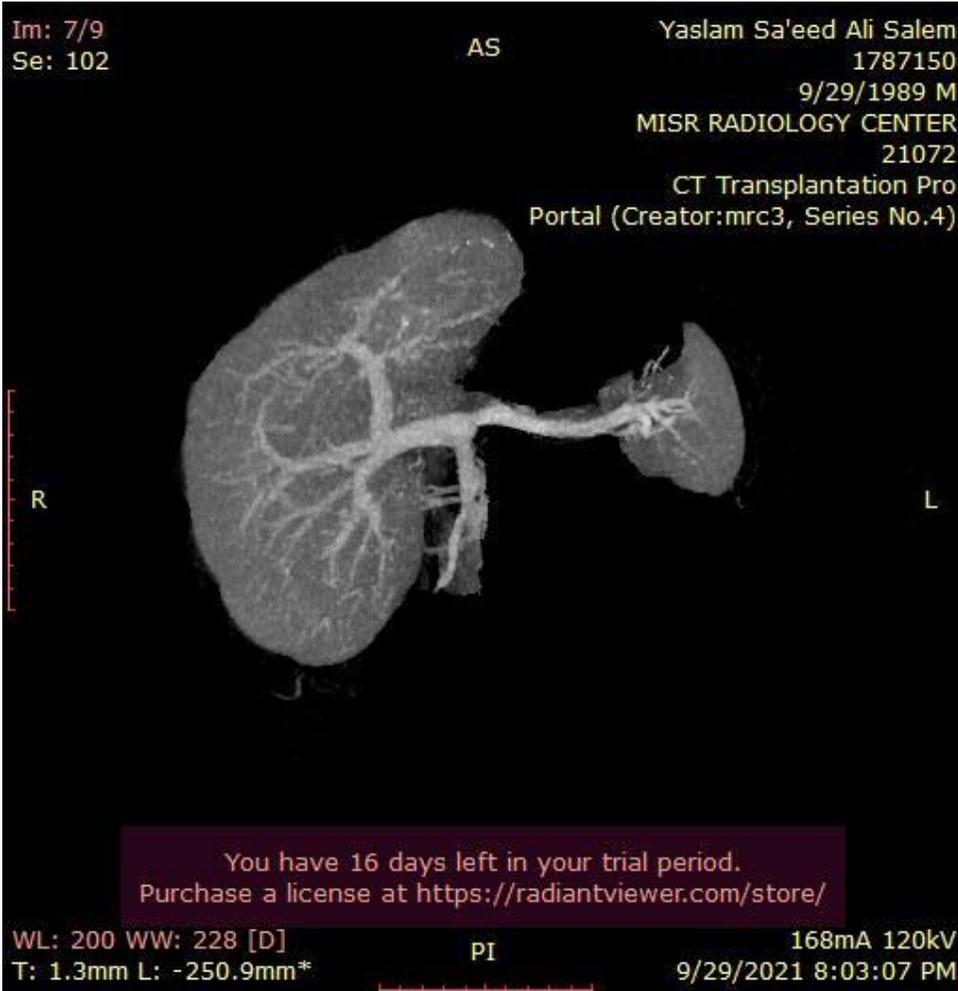


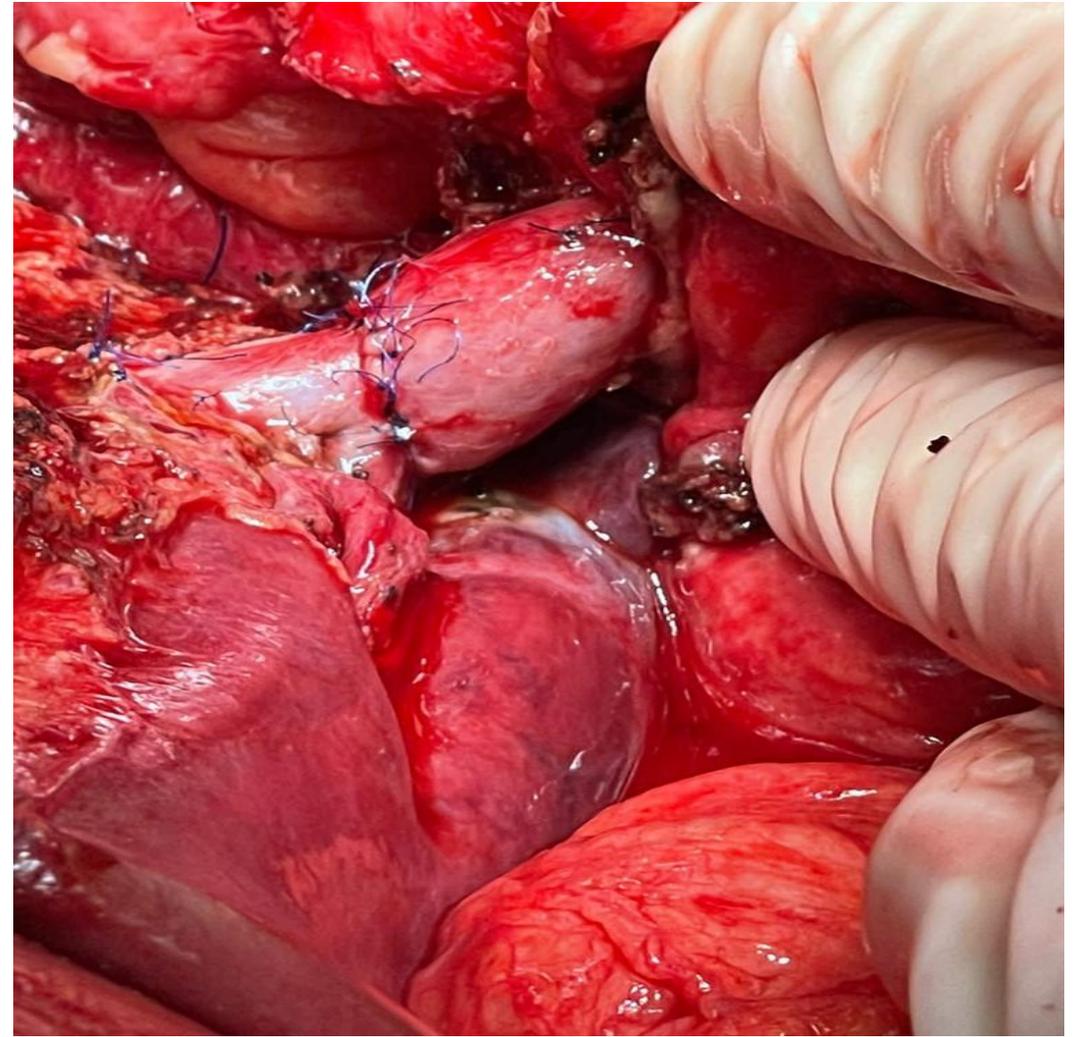
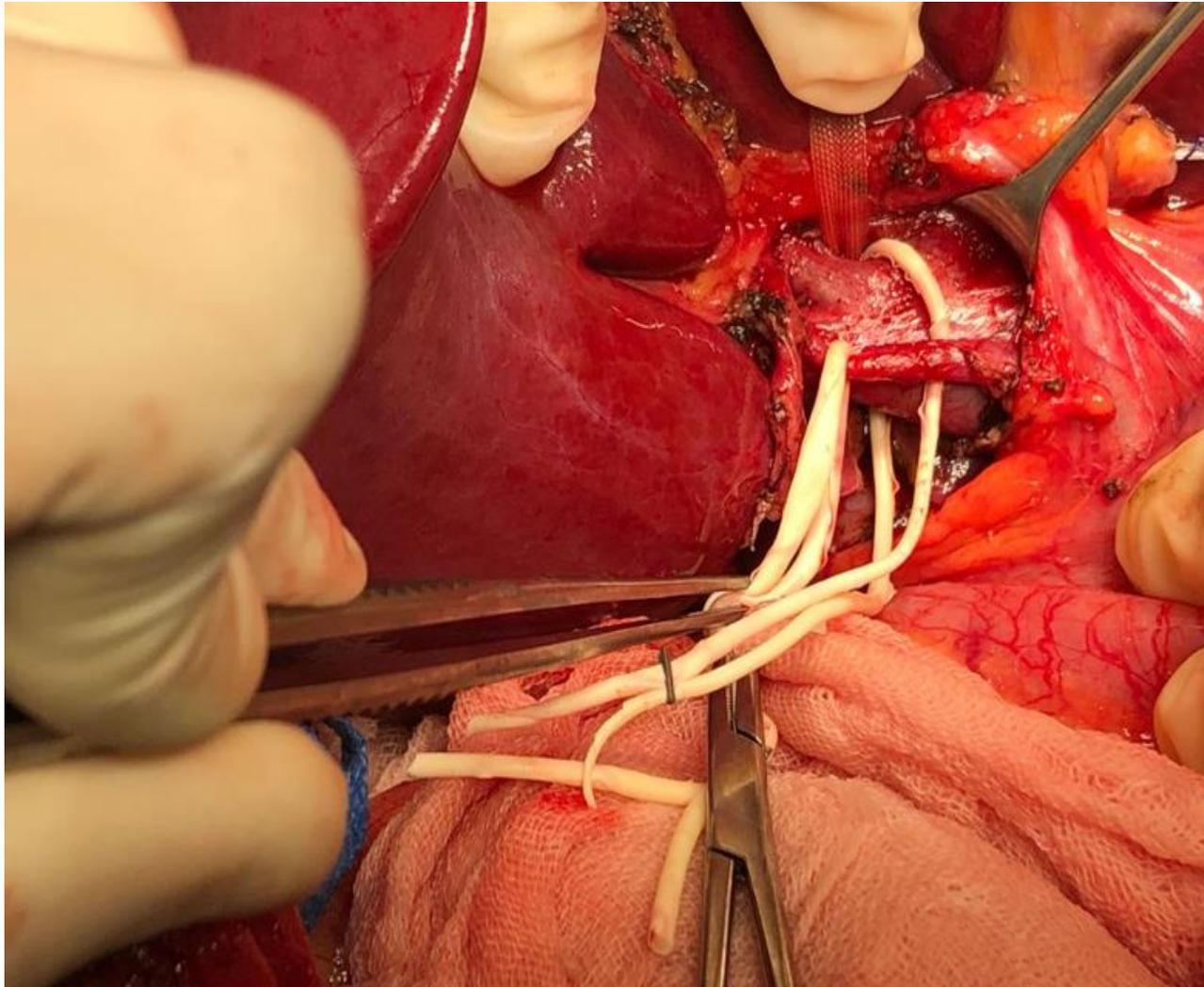


Portal Vein ramification



Type II portal vein

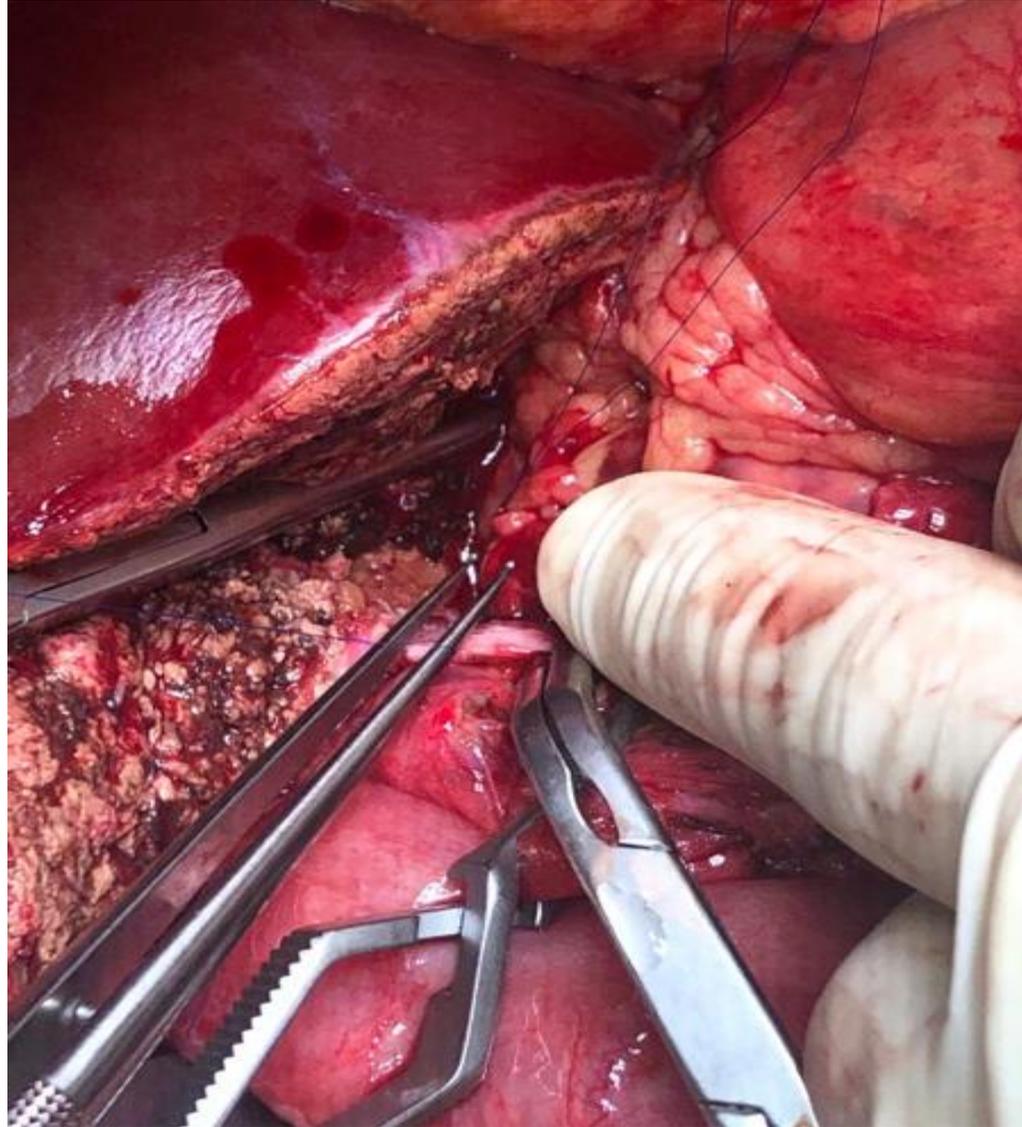


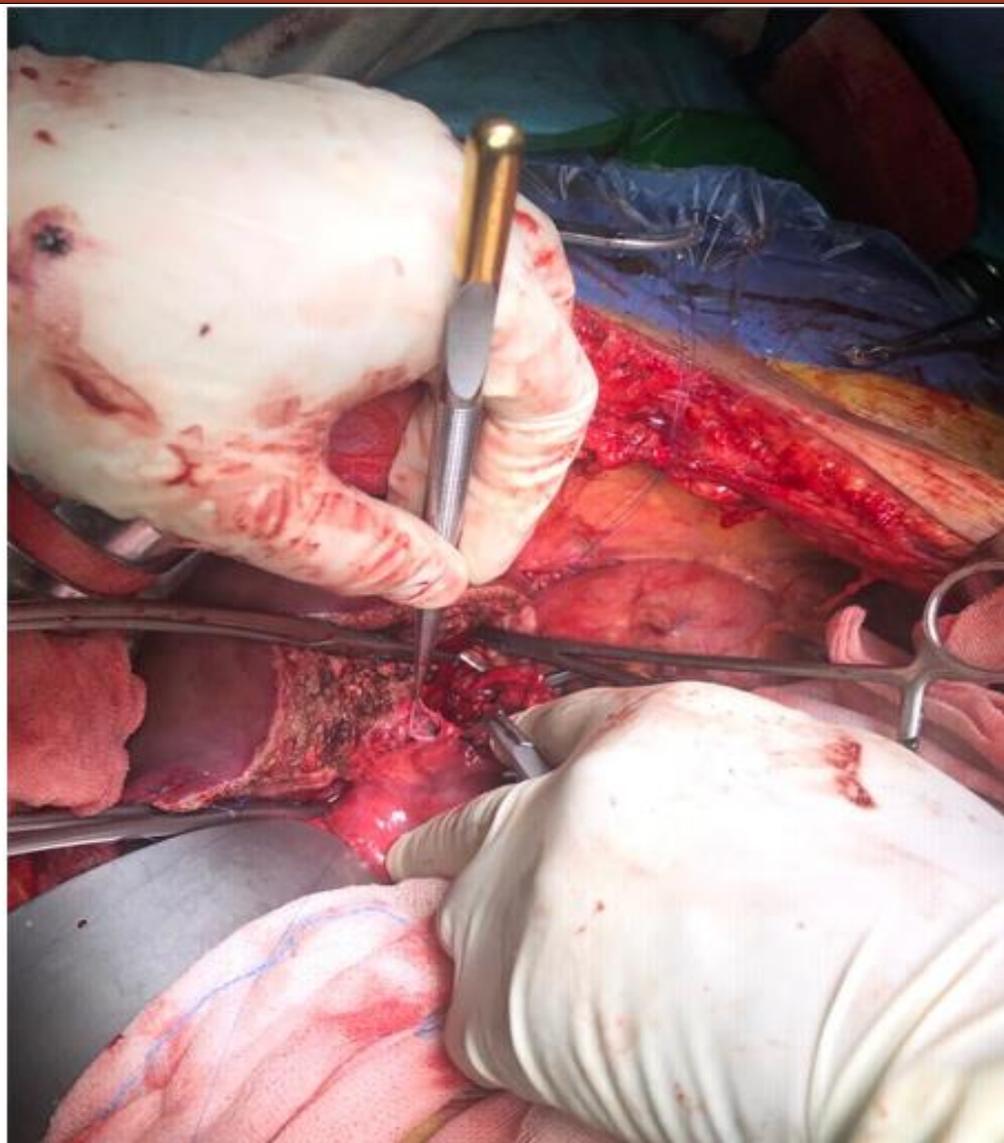


Portal vein Stenosis

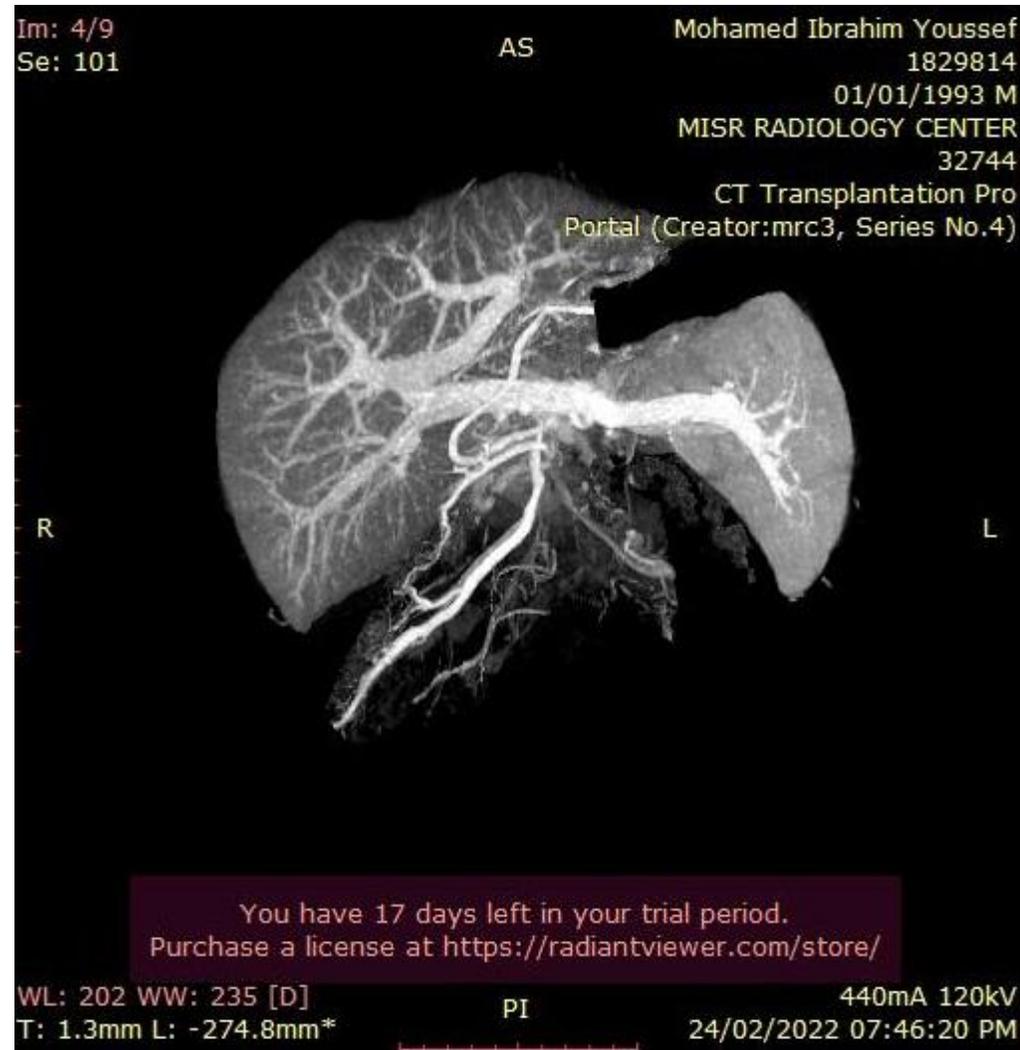
- Prevention
 - Bevelled recipient PV cutting
 - Two angles stretched sutures
 - Zero tension → to avoid burse string effect
 - Small bite
 - Growth factors (one or two)
 - Interrupted anterior sutures

Growth factor





Type III portal vein



- Decision : Left Lobe Graft

GRWR (Graft Recipient Weight Ratio)

- Patient weight
- 70 ----- 82 kg (GRWR : 0.67)
- 82 ----- 66 kg (GRWR : 0.85)

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MISR RADIOLOGY CENTER

MR.: MOHAMED IBRAHIM YOUSSEF PATIENT ID: 1829814
DEAR SIR. STUDY DATE: 24/02/2022

CT VOLUMETRY STUDY:-
Multislice axial contiguous cuts were taken through the abdomen after I.V. non-ionic contrast injection, in a triphasic fashion (arterial, porto-venous and delayed phases). 3D CT portography was also added to the examination.

FINDINGS:-

- Normal C.T. density of the liver parenchyma, with no focal lesions.
- No extra or intra-hepatic biliary dilatation.
- The **portal vein** is patent with normal appearance, no gross related anomalies. The right anterior portal arises with the left portal via a common origin (**Type III branching pattern**)
- Patent **hepatic veins** with dominant **right hepatic vein**, with no accessory vein is seen.
- The **hepatic artery** is patent and arising from the **coeliac trunk** and showing normal caliber and branchings.
- The spleen and pancreas show normal C.T. appearance.
- Both kidneys are functioning and normal.
- No significant abdominal lymphadenopathy.
- No ascites.
- Clear lung bases.

Volumetric Study: (Recipient weight 70 kgm)

- The right lobe volume segment V, VI, VII & VIII-MHV =968gms.
- The left lobe volume segment I, II, III & IV + MHV = 562 gms.
- The right lobe volume segment V, VI, VII & VIII + MHV = 1056 gms.
- The left lobe volume segment I, II, III & IV-MHV =474 gms.
- RLV with middle hepatic vein = 36.8%
- RLV without middle hepatic vein = 31%
- GRWR with middle hepatic vein = 1.50
- GRWR without middle hepatic vein = 1.38

MUCH OBLIGED
DR. ISLAM ALLAM, MD
AIA

Im: 1/9
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S

Mohamed Ibrahim Youssef
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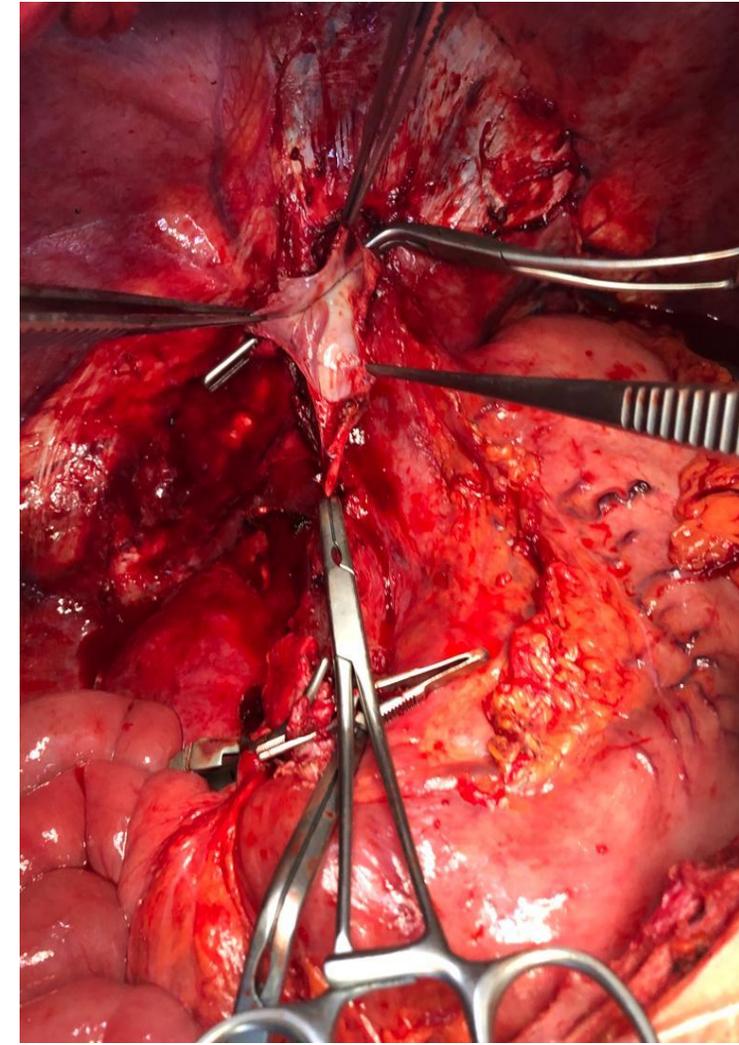
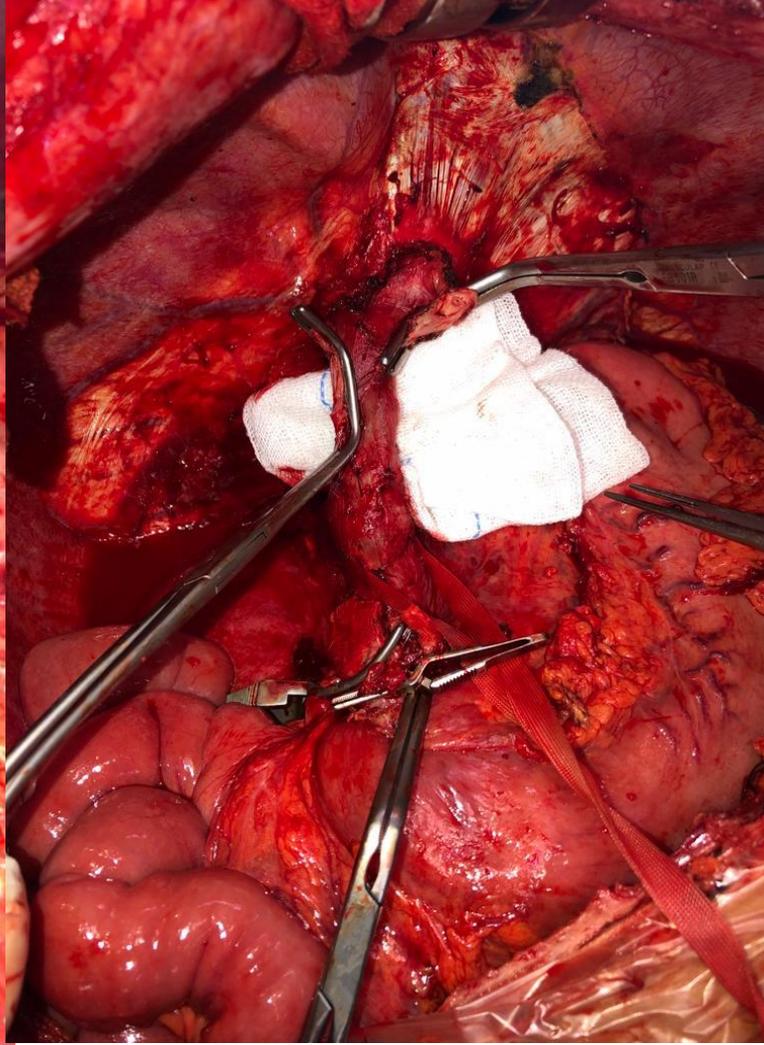
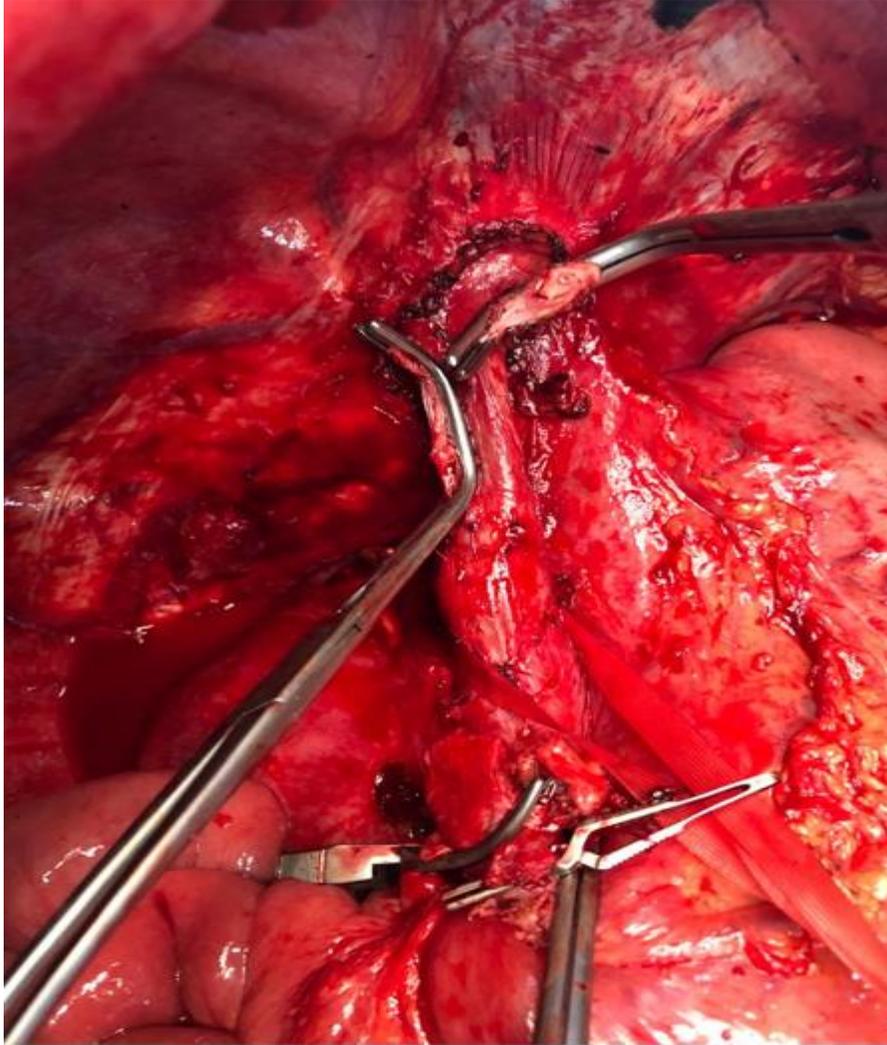
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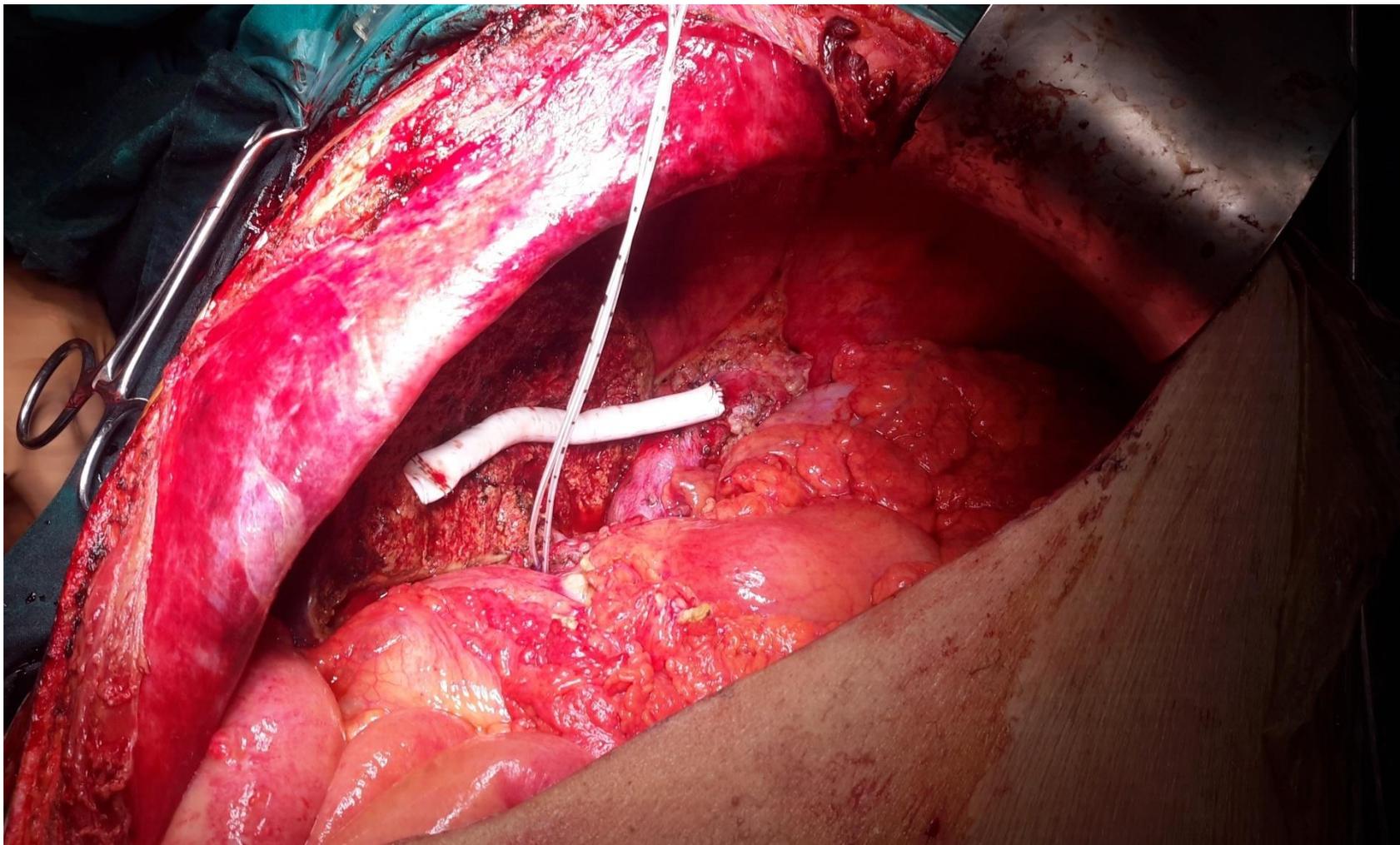
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Outflow



Cross clamping is mandatory

V5, V8 single anastomosis



2 V5

