

Department of Surgery University Hospital RWTH Aachen



Maastricht UMC⁺

Surgery for hilar cholangiocirconoma

Ulf Peter Neumann

Agenda



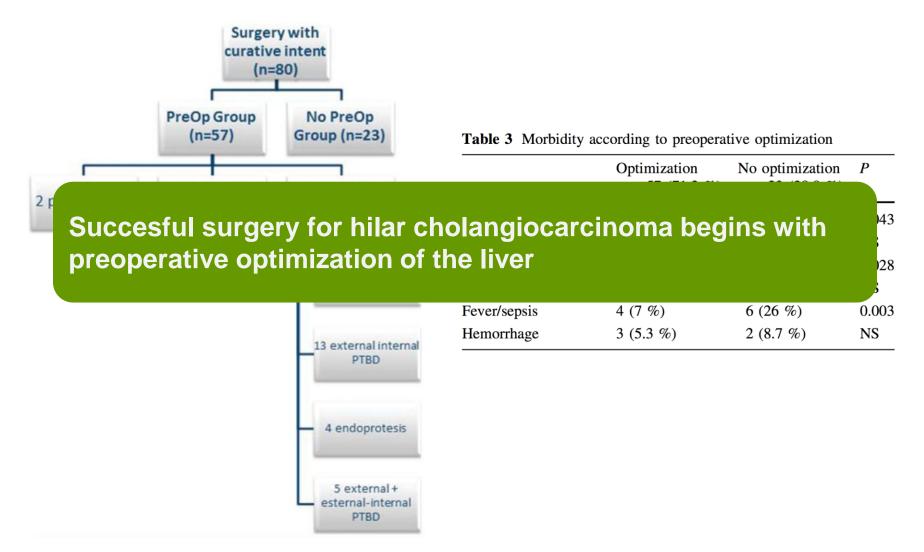
Operating on the most complex tumor in HBP Surgery

- Preoperative management
 - Does the patient require biliary stenting?
 - Is portal vein embolisation recommended prior to surgery?
- Operative technique
 - Hilar en bloc resection with or without PV resection?
 - Extended left or extended right resection?
 - Is arterial reconstruction worthwhile?
 - Is ALPPS feasible in hilar cholangiocarcinoma?
- Clincal cases
 - Extended right resection with portal vein resection
 - Left trisectionectomy with portal vein resection and arterial reconstruction





Does preoperative optimization improve outcome?



Ratti et al., World J Surg 2013





Biliary drainage for PHCC – Meta analysis

Morbititys complications

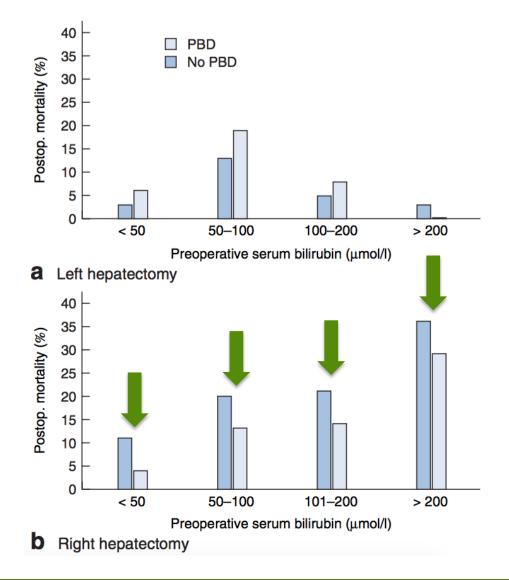
Study or sub-category	Treatment PBD n/N	Control no PBD n/N	OR (fixed) 95% Cl	Weight %	OR (fixed) 95% Cl		
Su	5/33	0/16		1.73	6.37 [0.33, 122.64]		
Takada1996	3/24	6/12	←− −−−	21.69	0.14 [0.03, 0.75]		
Hochwald	2/42	4/29	• • • • • • • • • • • • • • • • • • •	13.97	0.31 [0.05, 1.83]		
Figueras2000	1/11	2/9		6.20	0.35 [0.03, 4.65]		
Gerhards2000	16/93	3/18		12.90	1.04 [0.27, 4.01]		
parks2000	1/20	1/27	←	2.51	1.37 [0.08, 23.29]		
Dinant2006	14/83	2/14	·	- 8.82	1.22 [0.24, 6.05]		
Chen 2007	3/31	3/27		8.98	0.86 [0.16, 4.65]		
Ferrero2009	1/30	3/30		8.99	0.31 [0.03, 3.17]		
Li 2009	4/55	5/56	·	14.24	0.80 [0.20, 3.15]		
Total (95% CI)	422	238	-	100.00	0.70 [0.41, 1.19]		
Fotal events: 50 (Treatmen	t PBD), 29 (Control no PBD)						
Test for heterogeneity: Chi	?= 8.32, df = 9 (P = 0.50), l?= 0%	,					
Test for overall effect: Z =	1.32 (P = 0.19)						
			0.1 0.2 0.5 1 2 :	5 10			
			Favours treatment Favours con	trol			

Favours treatment - Favours control





Biliary drainage for PHCC – Meta analysis 2



Farges et al., Br J Surg 2013



What can be recommended regarding preoperative drainage?

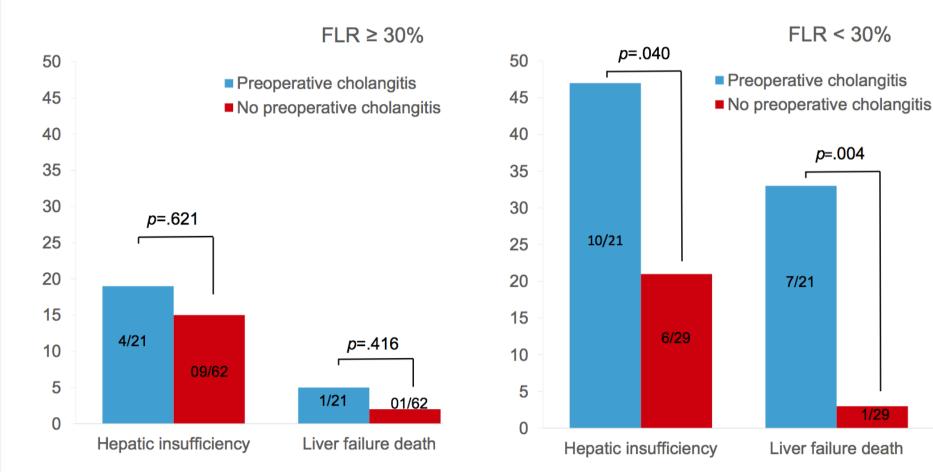
Selective preoperative Right lobectomy for Bismuth type IIIA or IV hilar Drainage cholangiocarcinoma Preoperative portal vein embolisation ٠ Biliary infection of the undrained bile duct • Severe pruritus **Total preoperative** Development of cholangitis after selective drainage • Drainage

Slow or insufficient resolution of hyperbilirubinemia •





What about future liver remnant volume?







Preoperative biliary drainage is recommend dependent on the individual clinical situation Volume modulation (PVE) should be considered if FLR is small





Surgical Technique from an oncological perspective

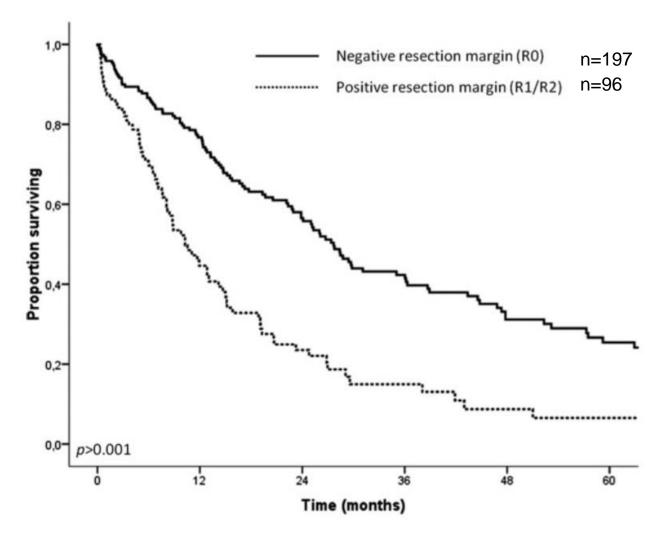
	Author / year	Cases	R0 (%)	Mortality	Overall Survival	
Isolated bile duct resection	Miyazaki 1998	11	45	0	16 % (3-yrs.)	
	Neuhaus 1999	14	29	0	33% (5-yrs.)	
	Launois 1999	11	-	0	27% (5-yrs.)	
Liver resection	Miyazaki 1998	65	75	15	33% (3-yrs.)	
	Neuhaus 1999	66	61	9	45% (5-yrs.)	
	Becker 2003	182	-	10	28% (5-yrs.)	
	Jarnagin 2001	80	78	-	46 m. (median OS)	
Extended liver resection	Neuhaus 2003	34*	-	1	72% (5-yrs.)	
	Nagino 2006	8	87.5	0	0070 (0 310.)	
OLT – Mayo protocol	lwatsuki 1998	38	83	21	25% (5-yrs.)	
	Cherqui 1995	20	93	15	30% (5-yrs.)	
	Heimbach 2004	20	-	13	82% (5-yrs.)	
		20			02/0 (0 9:0:)	

* With portal vein resection

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R0 vs. R1/R2 resection in hilar cholangiocarcinoma

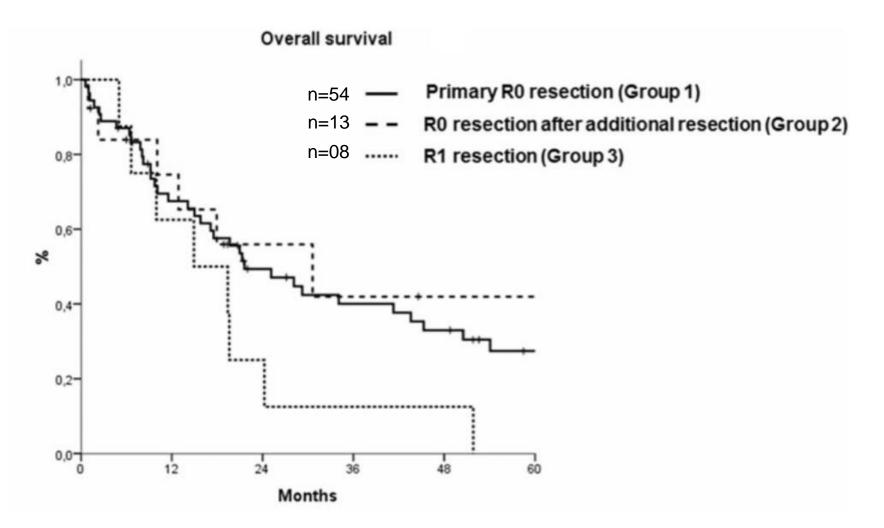


De Jong et al., Cancer 2012





R0 vs. R1/R2 resection in hilar cholangiocarcinoma

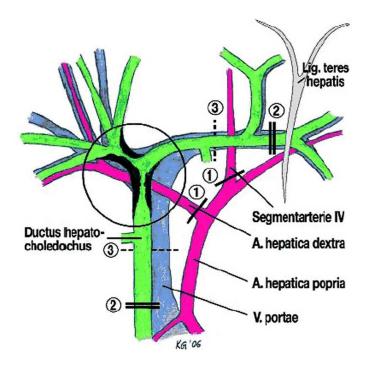


Ribero et al., Ann Surg 2011





Surgical evolution in treatment of PHCC

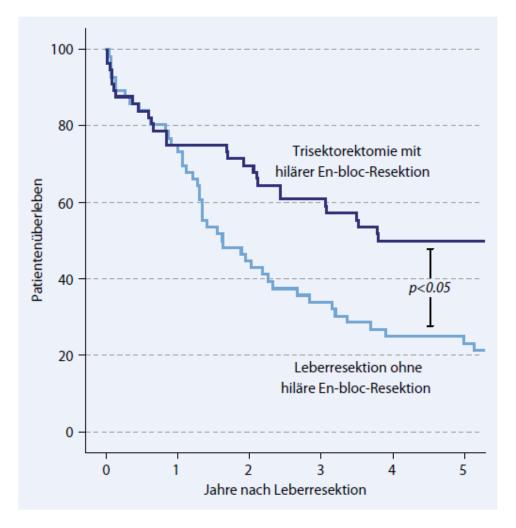


- Firstly described by Neuhaus (Berlin, Germany, 1999)
- Concept of hilar "no-touch" technique
- Procedure coined "hilar en-bloc resection" for PHCC

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Hilar en-bloc resection is superior to conventional resection



- 50 hilar en-bloc vs 50 conventional
- · 1990-2004, Charité, Berlin
- 1-yr. survival: 87%
- 2-yr. survival: 70%
- 5-yr. survival: 58%

No differences

- Surgical complications
- 30- / 90-day mortality



Is portal vein resection mandatory?

Combined portal vein resection in the treatment of hilar cholangiocarcinoma: A systematic review and meta-analysis

W. Chen, K. Ke, Y.L. Chen*

Department of Hepatobiliary Surgery, Union Hospital, Fujian Medical University, 29 Xin-Quan Road, Fuzhou, Fujian 350001, People's Republic of China

Systematic review & meta analysis

- including 1921 patients from 13 studies

Chen et al., Eur J Surg Oncol 2014

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Is portal vein resection mandatory?

	PVR		Without PVR			Odds Ratio		Odds Ratio	
Study or Subgroup		Total	Events	Total	Weight	M-H, Fixed, 95% C	l Year	M-H. Fixed, 95% Cl	
1.1.1 Postoperative m	-								
Neuhaus 1999	4	23	2	43	1.1%	4.32 [0.73, 25.65]			
Muñoz 2002	1	10	0	18	0.3%	5.84 [0.22, 157.58]			
Ebata 2003	2	52	5	108	2.9%	0.82 [0.15, 4.40]			
Miyazaki 2007	3	34	8	118	3.0%	1.33 [0.33, 5.32]			
Dinant 2006	2	7	6	30	1.5%	1.60 [0.25, 10.36]			
Zhou 2008	1	21	1	65	0.4%	3.20 [0.19, 53.52]			
Song 2009	5	51	6	208	2.0%	3.66 [1.07, 12.51]			
Hemming 2011	1	42	4	53	3.2%	0.30 [0.03, 2.78]			
Tamoto 2013	1	36	1	13	1.3%	0.34 [0.02, 5.92]	2013		
Subtotal (95% CI)		276		656	15.7%	1.60 [0.90, 2.86]			
Total events	20		33						
Heterogeneity: Chi ² = 7				0%					
Test for overall effect:	Z = 1.59 (F	P = 0.1	1)						
1.1.2 Overall complic	ations								
Muñoz 2002	3	10	4	18	1.8%	1.50 [0.26, 8.64]	2002		
Ebata 2003	44	52	85	108	7.8%	1.49 [0.62, 3.60]			
Miyazaki 2007	13	34	42	118	10.7%	1.12 [0.51, 2.46]			
Dinant 2006	7	7	18	30		10.14 [0.53, 193.89]			
Han 2007	3	11	8	36	2.5%	1.31 [0.28, 6.14]			
Song 2009	24	51	82	208	15.8%	1.37 [0.74, 2.53]			
Tamoto 2013	21	36	10	13	5.7%	0.42 [0.10, 1.79]			
Subtotal (95% CI)	21	201	10	531	44.8%	1.30 [0.89, 1.88]	2010	•	
Total events	115		249					-	
Heterogeneity: Chi ² = 4		S(P = 0)		0%					
Test for overall effect:				0.10					
			.,						
1.1.3 Postoperative li									
Ebata 2003	14	52	21	108	9.2%	1.53 [0.70, 3.32]			
Miyazaki 2007	4	34	18	118	6.6%	0.74 [0.23, 2.36]			
Zhou 2008	1	21	4	65	1.7%	0.76 [0.08, 7.23]			
Song 2009	1	51	21	208	7.5%	0.18 [0.02, 1.36]			
Tamoto 2013	3	36	2	13	2.5%	0.50 [0.07, 3.39]	2013		
Subtotal (95% CI)		194		512	27.5%	0.83 [0.48, 1.43]		-	
Total events	23		66						
Heterogeneity: Chi ² = 4				18%					
Test for overall effect:	Z = 0.67 (F	^o = 0.5	0)						
1.1.4 postoperative b	ile leak								
Ebata 2003	6	52	8	108	4.2%	1.63 [0.53, 4.97]	2003		
Miyazaki 2007	3	34	14	118	5.3%	0.72 [0.19, 2.66]			
Zhou 2008	3	21	5	65	1.9%	2.00 [0.44, 9.19]	2008	- 	
Tamoto 2013	2	36	0	13	0.6%	1.96 [0.09, 43.47]			
Subtotal (95% CI)		143		304	12.1%	1.31 [0.65, 2.64]		+	
Total events	14		27						
Heterogeneity: Chi ² = 1	.31, df = 3	3 (P = (0.73); I ² =	0%				0.01 0.1 1 10 100	
Test for overall effect:	Z = 0.75 (F	P = 0.4	5)					PVIR Without PVR	

In PV-group significantly more patients with:

- LN-metastases
- Locally advanced tumors
- Perineural invasion
- Less R-0 resections

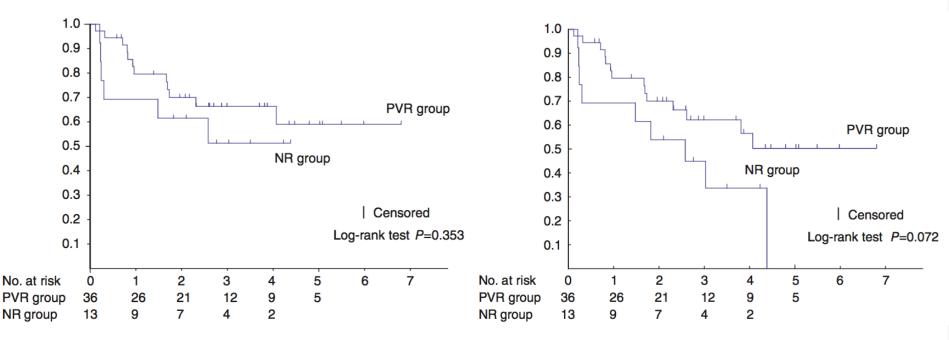
No differences in morbidity & mortality

Recurrence-free survival



Is portal vein resection mandatory?

Overall survival



...tumors in the PVR group were more locally advanced...

Tamoto et al., HBP 2014





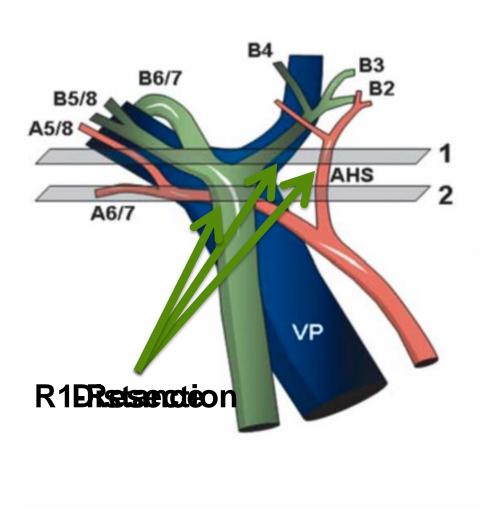
R0 resection is key for long-term survival of patients with hilar cholangiocarcinoma

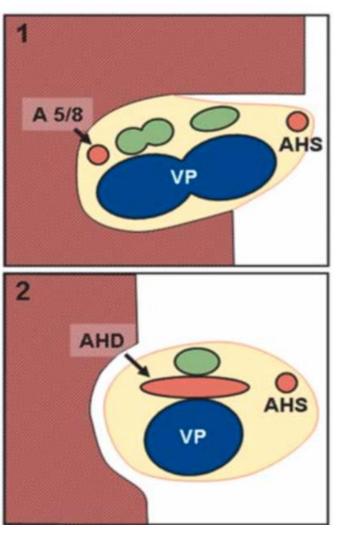
Preferred Technique: Hilar en-bloc resection (with PV resection)

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All surgical approaches should be conceptualised by anatomy





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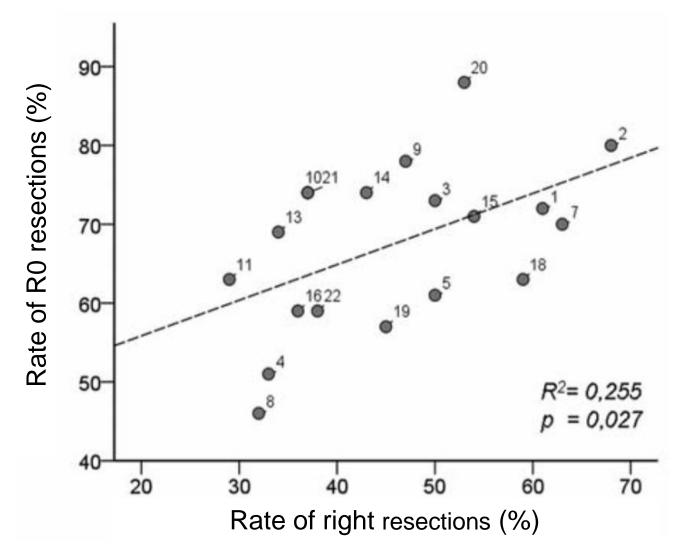
How to achieve R0 resections

Author, Study period	Ν	Ext. R. (%)	R0 (%)	Mort (%)	5-yr-OS R0	5-yr-OS R1	5-yr-OS
Mansfield, 1995–2003	18	61	72	17			21
Hemming, 1997–2004	53	68	80	9	45	0	35
Lai, 1998–2002	26	50	73	8	16	0	12
Silva, 1992–2003	45	33	51	9	41	24	
Sano, 2000–2004	102	50	61	0			44
Cheng, 1997–2002	75	33		1			12
Witzigmann, 1994–2004	59	63	70	12	27	10	22
Baton, 1984–2003	59	32	46	5	28	6	20
Hasegawa, 1990–2003	49	47	78	2			40
Otani, 1990–2005	27	37	74	0	~34	0	27
lto, 1985–2006	38	29	63	3	~62	0	31
Yubin, 1990–2004	115						~25
Konstadoul, 1988–2006	59	34	69	7			35
Murakami, 1990–2007	42	43	74	7			30
Lee, 2001–2008	302	54	71	2	47	8	33
Miyazaki, 2001–2008	107	36	59	2	33	21	~28
Rocha, 2001–2008	60		80	5	~55	~20	
Unno, 2001–2008	125	59	63	8	46	19	35
Young, 2001–2008	51	45	57	8	40		20
Hirano, 2001–2008	146	53	88	3			36
lgami, 2001–2008	298	37	74	2			42
van Gulik, 1998–2003	29	38	59	10			34

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How to achieve R0 resections





Extended left or extended right resections?

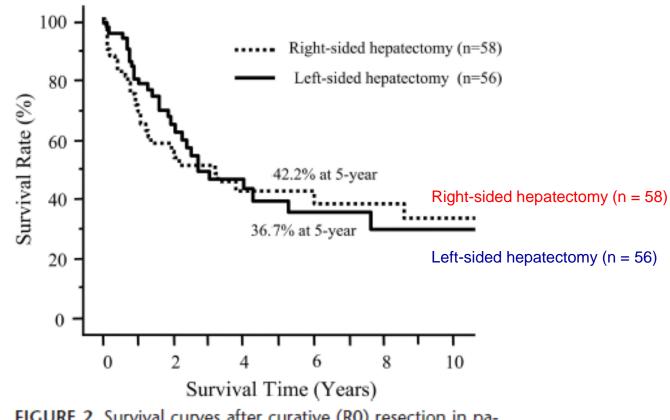


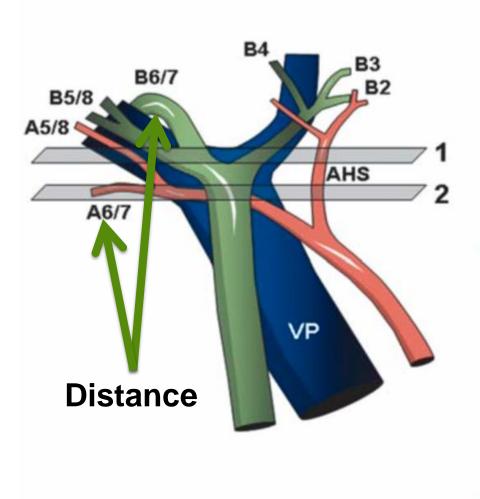
FIGURE 2. Survival curves after curative (R0) resection in patients undergoing right- or left-sided hepatectomy for hilar cholangiocarcinoma.

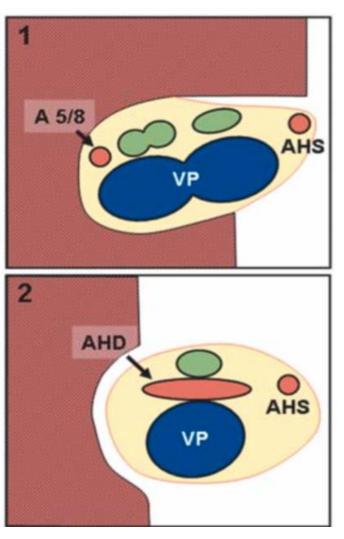
Shimizu H et al., Ann Surg 2010

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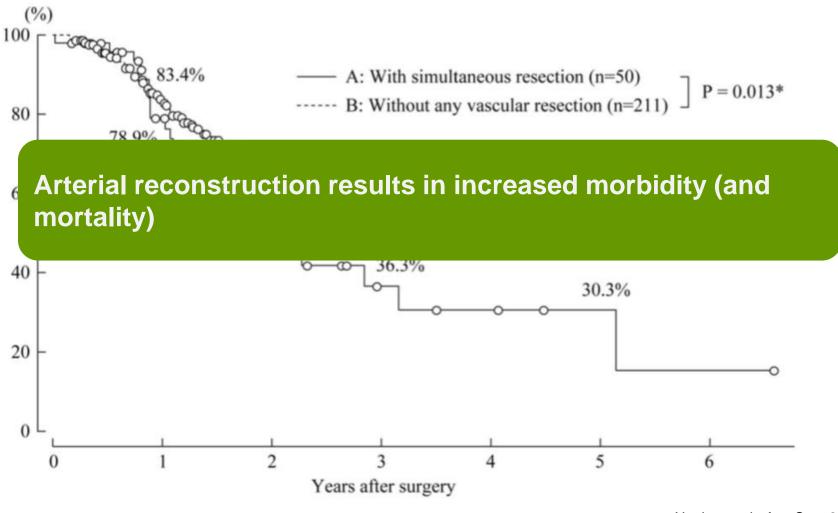
Management of the right liver artery







Is arterial reconstruction worthwhile?

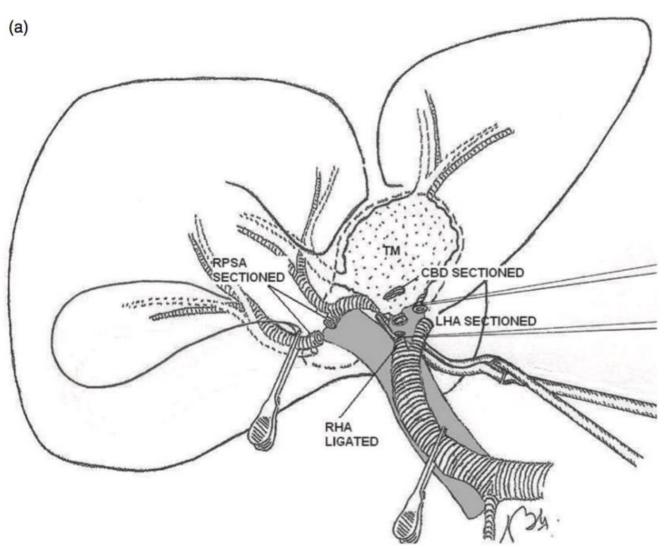


Nagino et al., Ann Surg 2010

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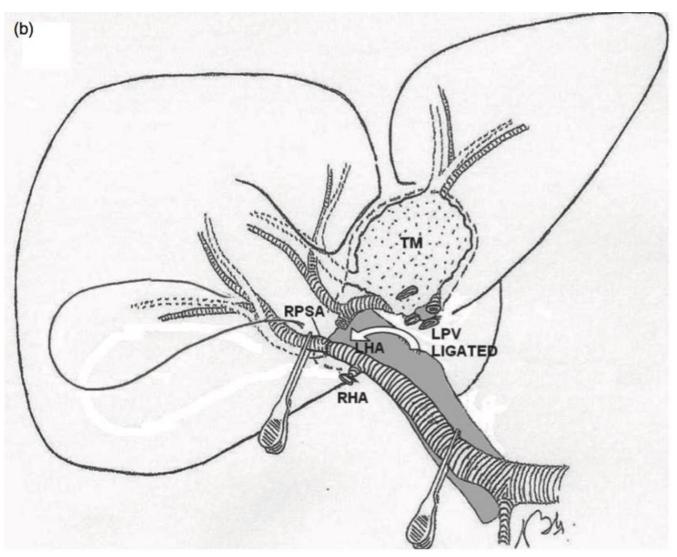
Example of arterial reconstruction



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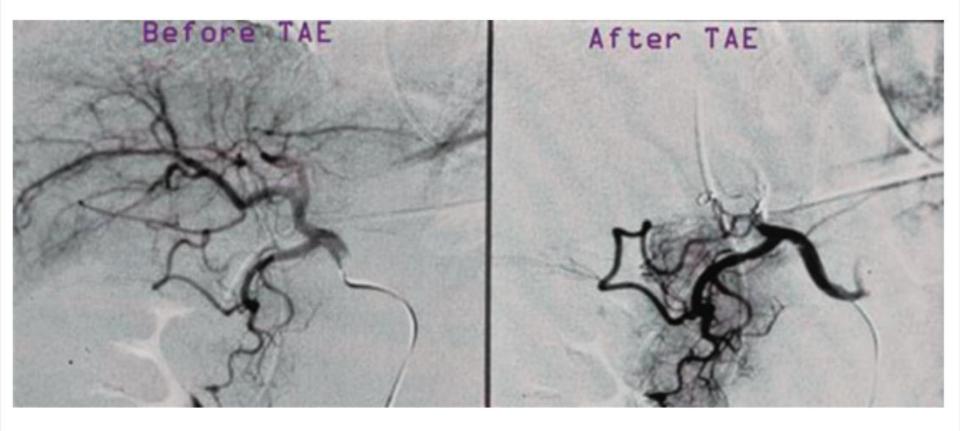
Example of arterial reconstruction







Preoperative hepatic artery embolization

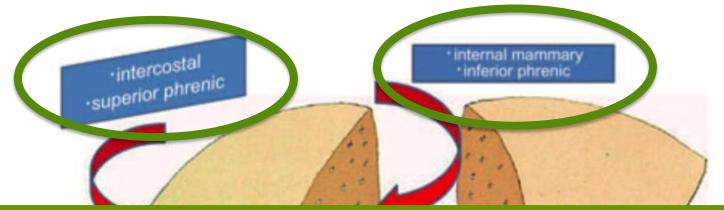


Yasuda et al., HBP 2010

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Arterial collaterales after TAE



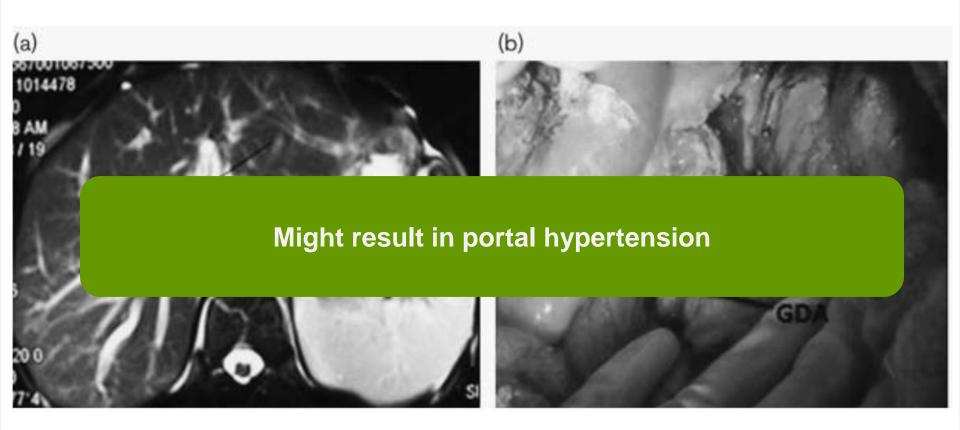
Avoid extensive mobilization of the right liver lobe to preserve arterial collaterals



Yasuda et al., HBP 2010



Arterialisation of the portal vein

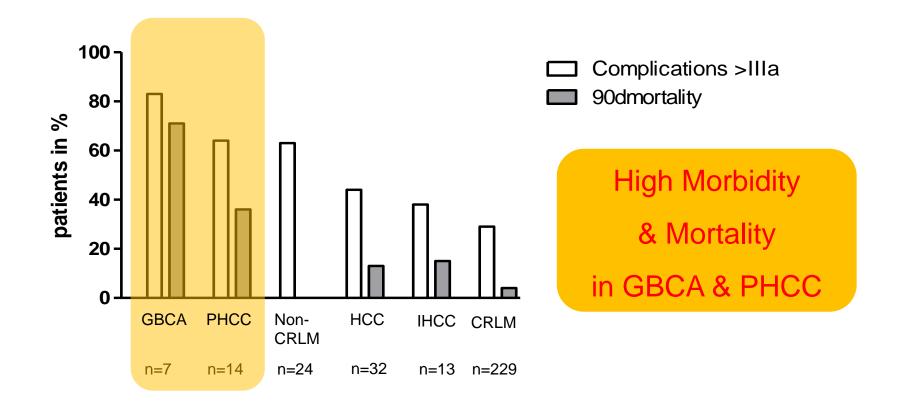


Qiu et al., Eur J Gastroentorol Hepatol 2012





Should we use ALPPS for hilar cholangiocarcinoma

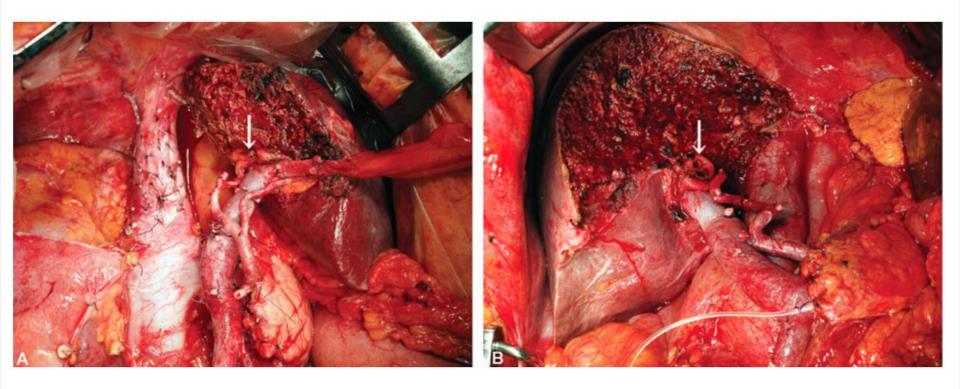


Schadde et al., Ann Surg 2015



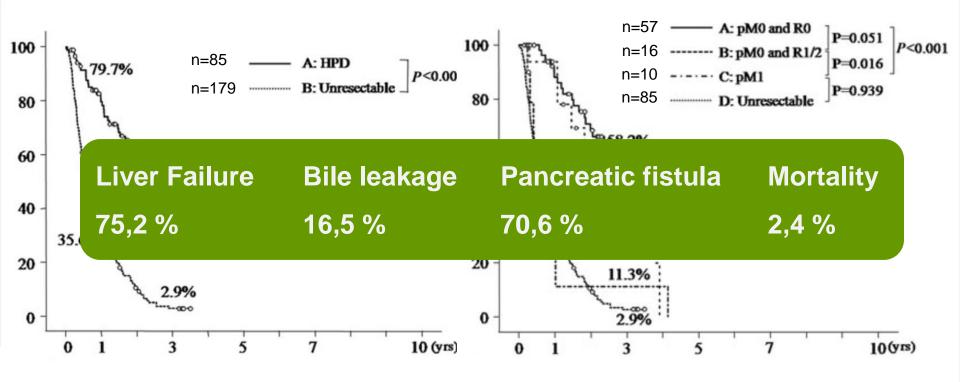


Hepatopancreatoduodenectomy for advanced tumors



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Hepatopancreatoduodenectomy for advanced tumors







Extended right resections should be performed to achieve a high rate of R0 resections if technically feasible

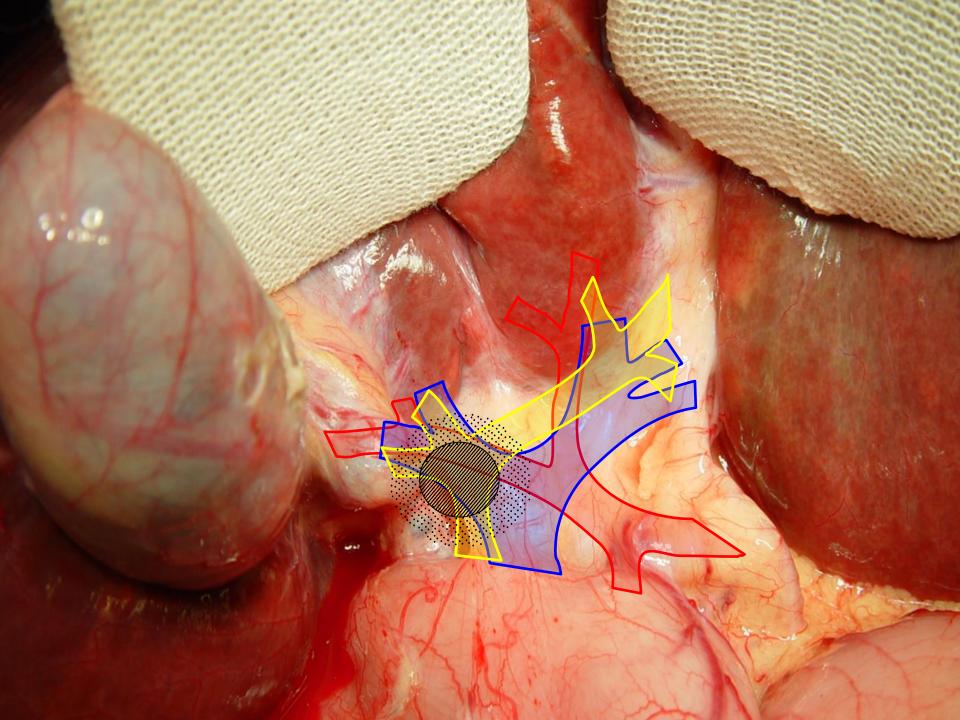
Preoperative portal vein embolisation in case of right resections Arterial reconstruction and/or Hepatopancreatoduodenoectomy is

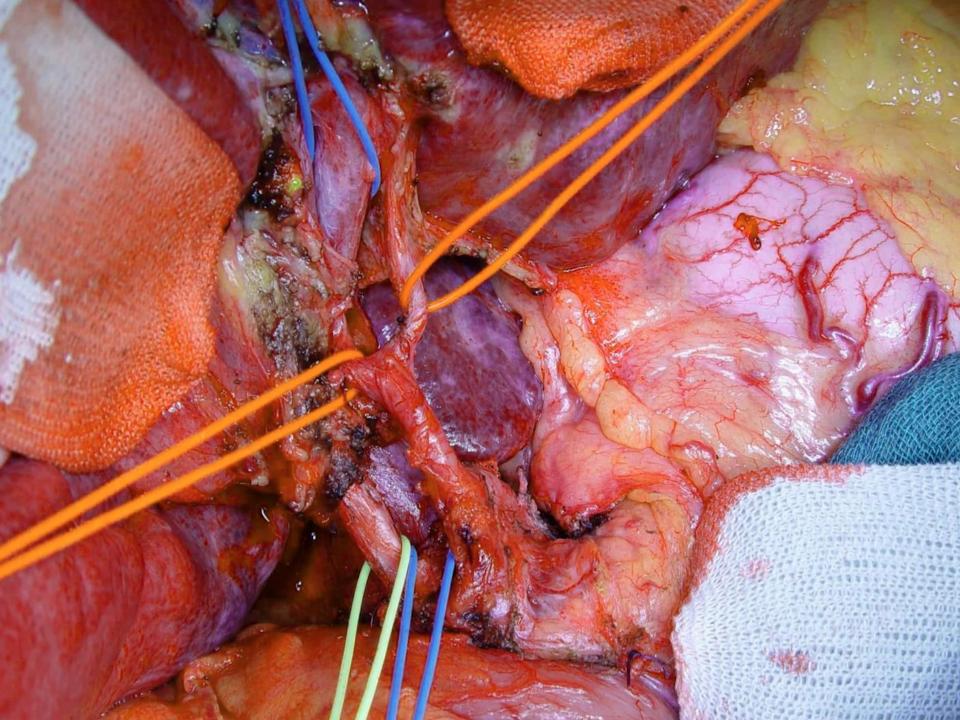
an option in selected cases

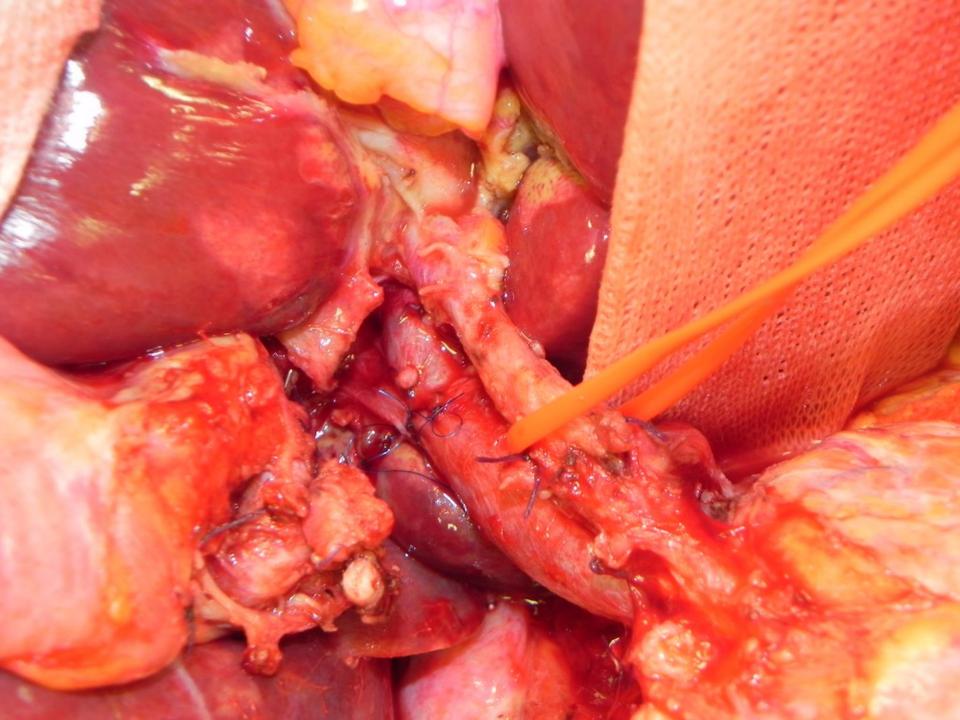


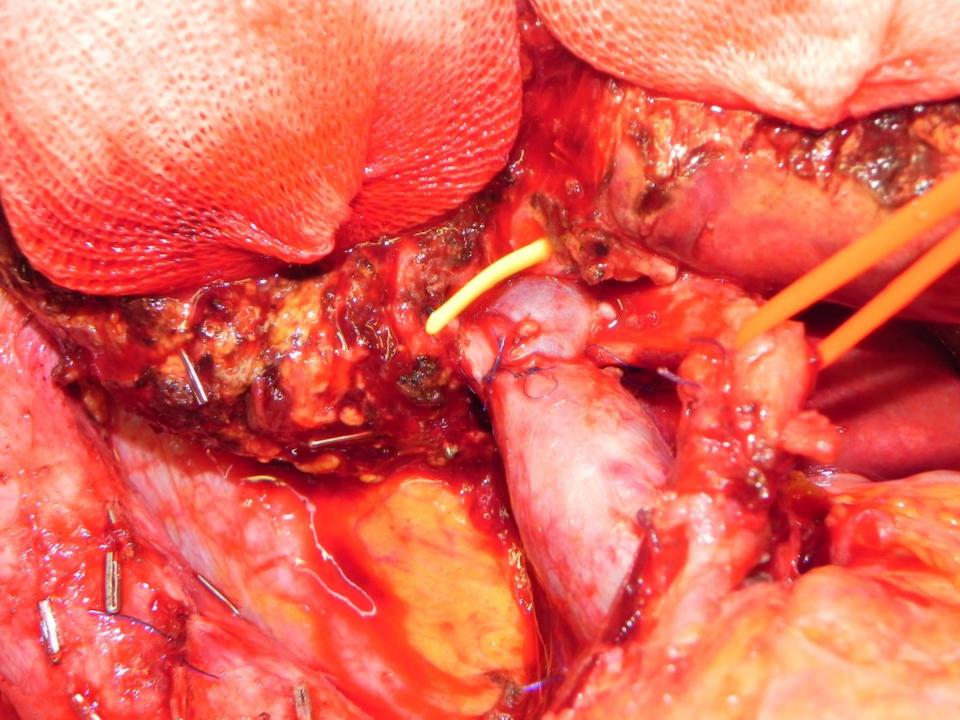


Extended right resection combined with portal vein resection













Left trisectionectomy

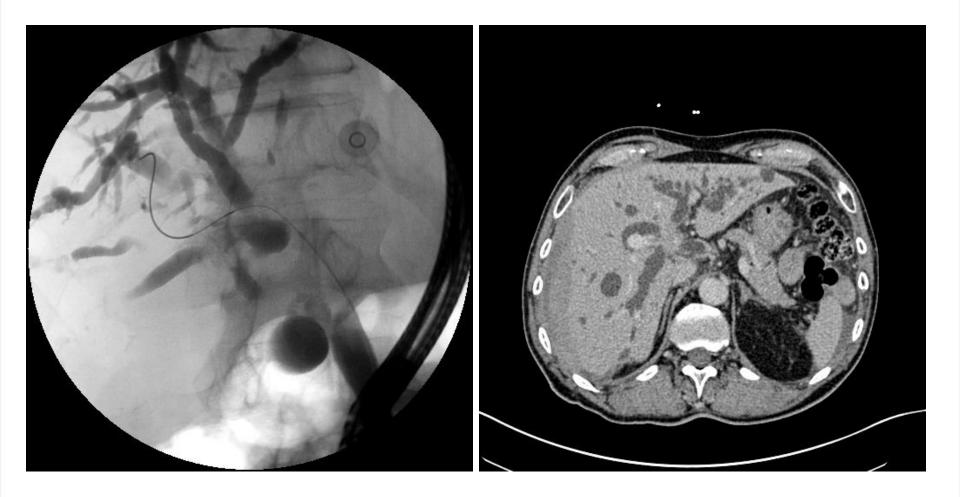
combined with portal vein resection and arterial reconstruction

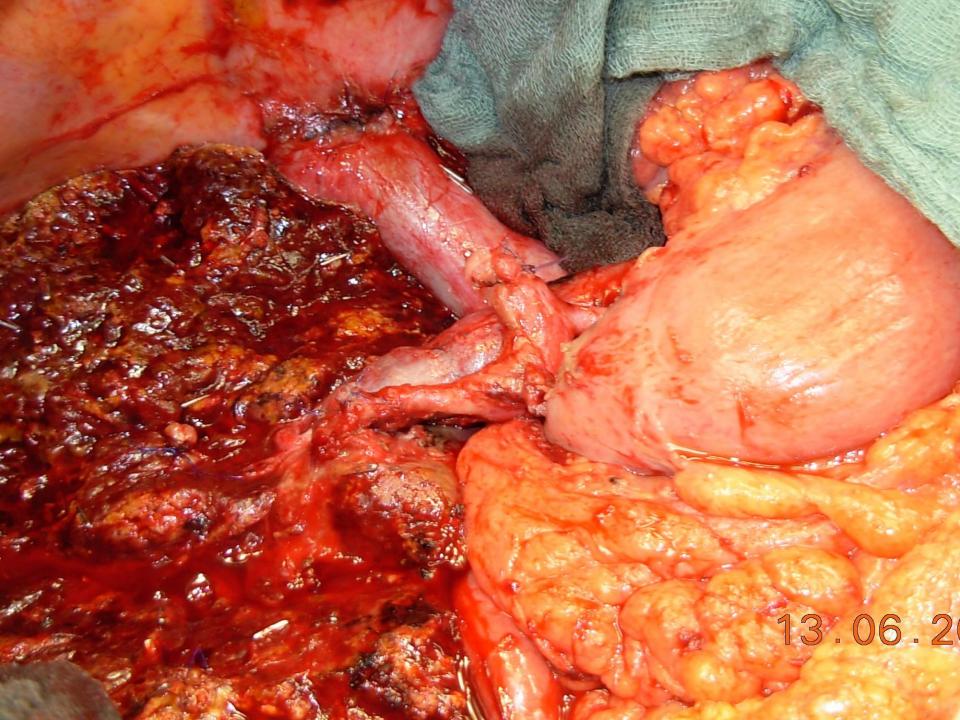
Clinical Cases





Left trisectionectomy with PV resection and arterial reconstruction



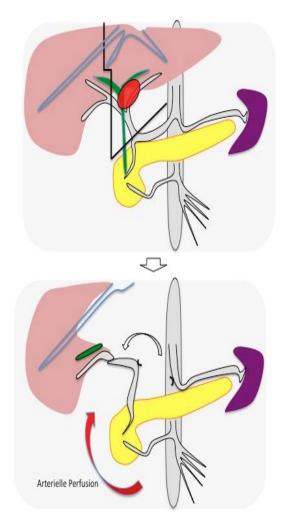


Clinical Cases

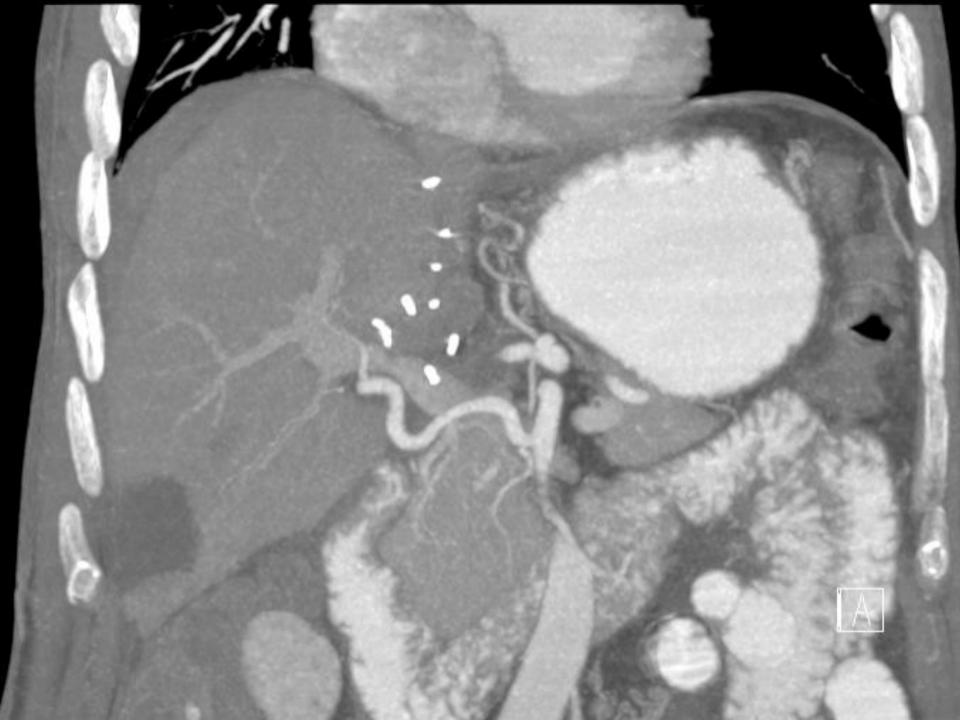




Left trisectionectomy with PV resection and arterial reconstruction







Thank you for your attention



ESCAM – European Surgical Center Aachen - Maastricht



- Newly founded HPB center in the heart of Europe
- Merge of 2 tertiary referral University HPB units (10/2015)
 - University Hospital Aachen (1500 beds), Germany
 - University Hospital Maastricht (500 beds), Netherlands
- ~ 400 Liver resections / yr., ~ 200 Pancreas resections / yr.
- 60-80 liver transplants, 40-50 kidney transplants