

**Joint Congress of 6th Biennial Congress of the Asian-Pacific Hepato-Pancreato-Biliary Association
and the 29th Meeting of Japanese Society of Hepato-Biliary-Pancreatic Surgery
(Yokohama, 2017)**

Historical review

Extended resection for biliary tract cancer (BTC) A large contribution of Japanese surgeons towards standardization

**Panel of Biliary Surgery, East meets West,
Japanese Society of Hepato-Biliary-Pancreatic Surgery**

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Acknowledgements

- Yuji Nimura (Nagoya University)
- Yu Takahashi & Akio Saiura (Cancer Institute Hospital)
- Yuta Abe & Kenzo Hibi (Keio University)
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- Yoshifumi Ogura (Matsusaka City Hospital)
- Yoshito Kotera (Tokyo Women's Medical University)

Three resectional procedures for BTC

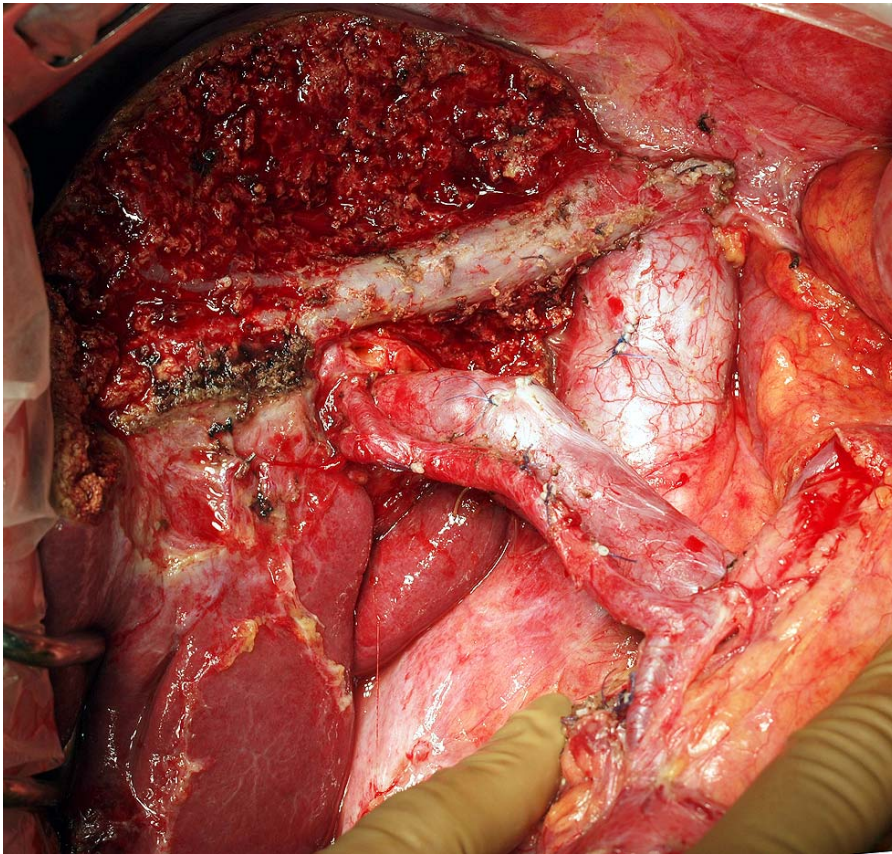
- **Caudate lobectomy for perihilar cholangiocarcinoma (PCC)**
- **Hepatectomy combined with vascular resection**
- **Hepatopancreatoduodenectomy (HPD)**

Who performed them first and when? Who diffused them?

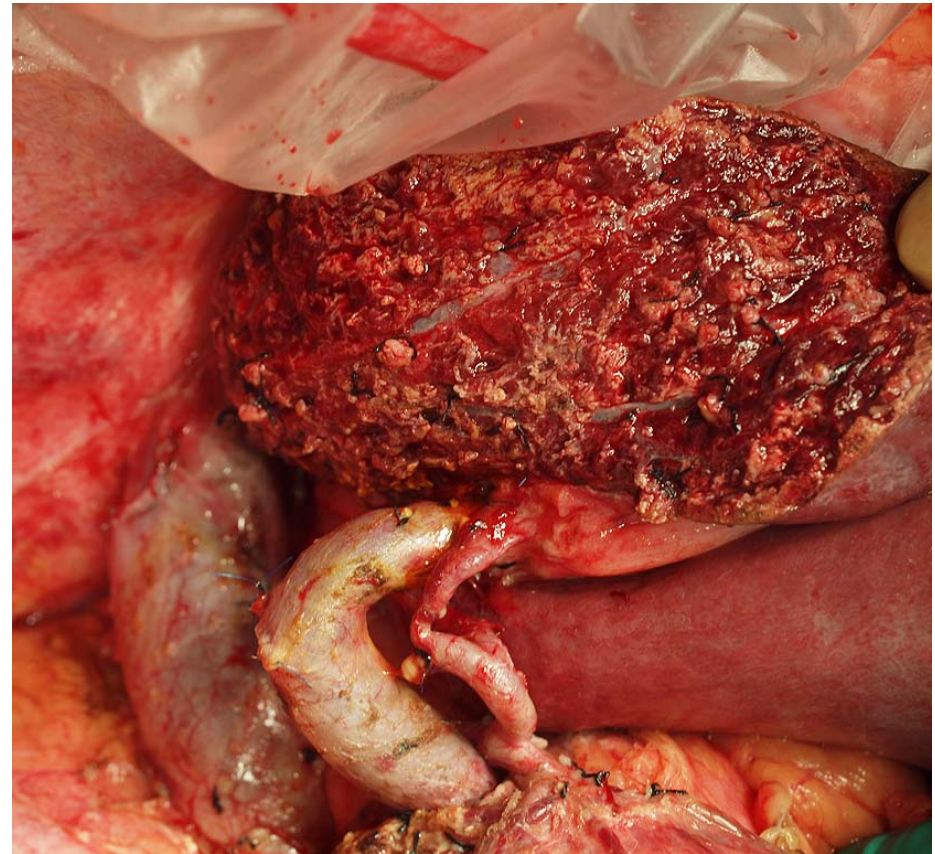
1. Caudate lobectomy for PCC

Why do we have to resect the caudate lobe?

Left hepatectomy



Right hepatectomy



Simple history of surgical challenge for PCC

1948	Longmire		Intrahepatic cholangiojejunostomy	
1954	Brown		Hilar BDR (n=2)	
1957	Altemeier		T-tube drainage	
1962	Altemeier		Left hepatectomy+BDR	survival
1964	Quattlebaum		Right hepatectomy+BDR+IVC	dead
1965	Kajitani		Right hepatectomy+BDR+PV	survival
1969	Bird		Right trisectionectomy+BDR	survival
1973	Longmire		Right trisectionectomy+BDR+PV	survival
1974	Fortner		Major hepatectomy+BRR+PV (n=3)	all dead
1976	Fortner		Liver transplantation (n=4)	all dead
1979	Blumgart		Left hepatectomy + caudate lobectomy	survival

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1979	Blumgart		Left hepatectomy + <u>caudate lobectomy</u>	survival

The world-first caudate lobectomy for PCC in 1979

(Br J Surg 66; 762-769, 1979)



Leslie Harold Blumgart
Hammersmith Hospital, England

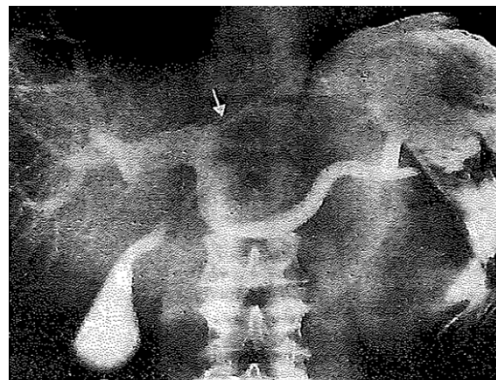
Among 37 hepatectomized patients, one patient underwent en bloc resection of the left liver and caudate lobe. Histologically, the tumor invaded the left liver and caudate lobe.

PTC



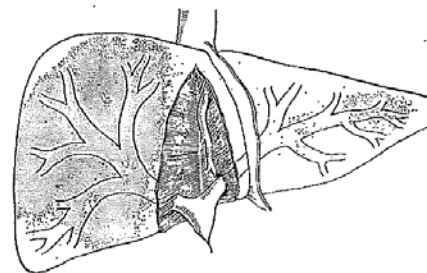
Bismuth type II?

Portography

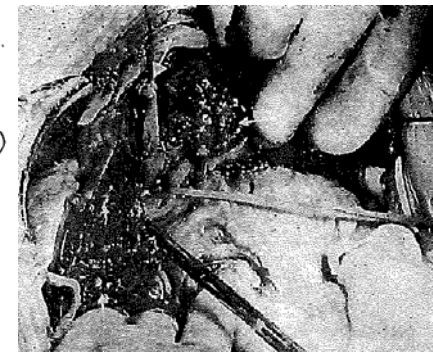


Occluded left PV

Liver splitting method



Division of the RHD proximal to the tumor



Surgical result in Japan around 1970

Yoji Iwasaki
(Chiba Univ)

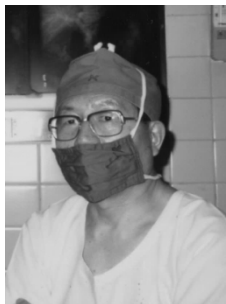


Treatment of carcinoma of the biliary system. SGO 1977

Total	n=14
BDR	n=12
Left Hx+BDR	n=2

Intraoperative RT was performed in advanced tumor.

Toshiharu Tsuzuki
(Keio Univ)



Carcinoma of the proximal bile ducts. SGO 1978

Total	n=19
T-tube drainage	n=12
Biliary bypass	n=3
BDR	n=2
Left Hx+BDR	n=2

Postoperative RT was added for residual tumor.

Representative surgical results during 1980s

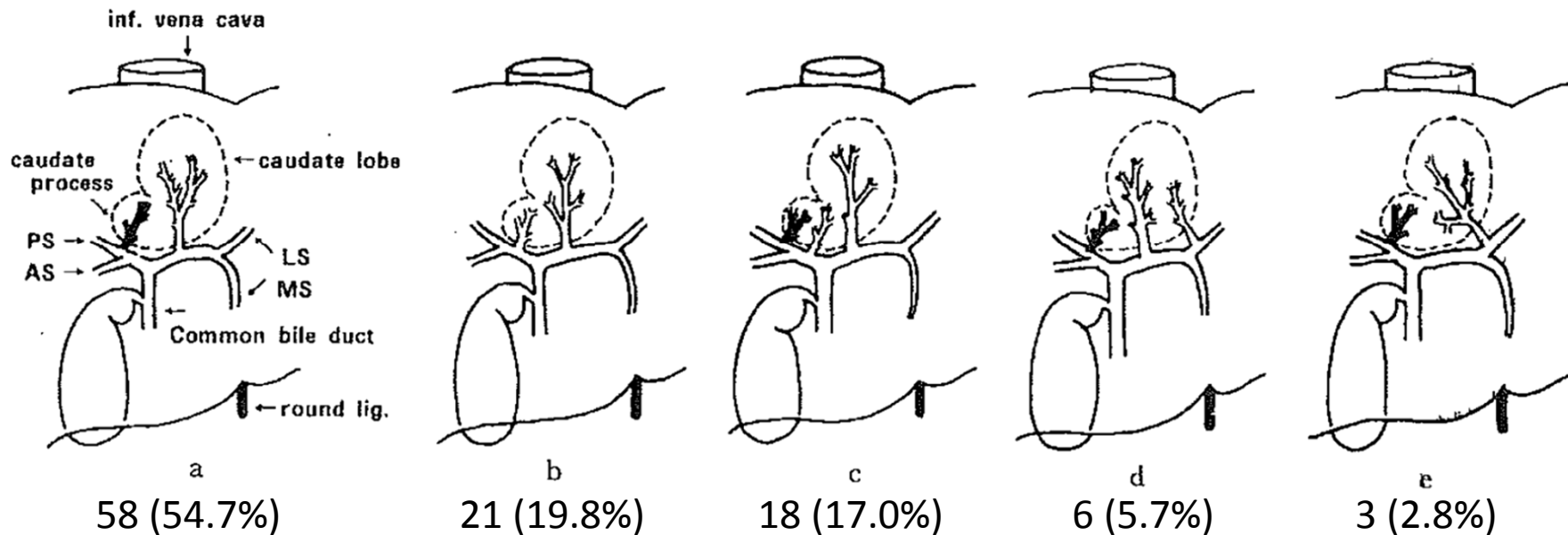
	Toshiharu Tsuzuki (Keio Univ.)	Ryuji Mizumoto (Mie Univ.)	Yoji Iwasaki (Tsukuba Univ.)
Journal	Arch Surg 1983	SGO 1986	SGO 1986
No. of pts	31	32	46
No. of resection	16 (52%)	26 (81%)	21 (46%)
Major Hx	15	11	9
Caudate lobectomy	9	8	9
Vascular resection	3	0	0
R0	10	10	10
Mortality	2 (13%)	1 (4%)	2 (10%)
Survival time (mo)	24	9-12	NA

Biliary anatomy of the S1 by Mizumoto (Mie Univ.)

(in Japanese, 1983 and in English, 1986)

Histologic findings of the resected specimen (n=26)

- Liver invasion around the hepatic hilus n=12
- Invasion of B1 n=8
- Invasion of S1 n=3



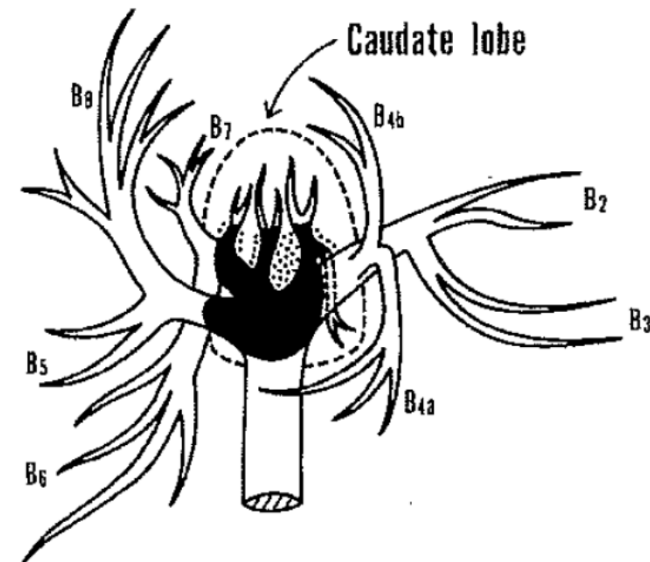
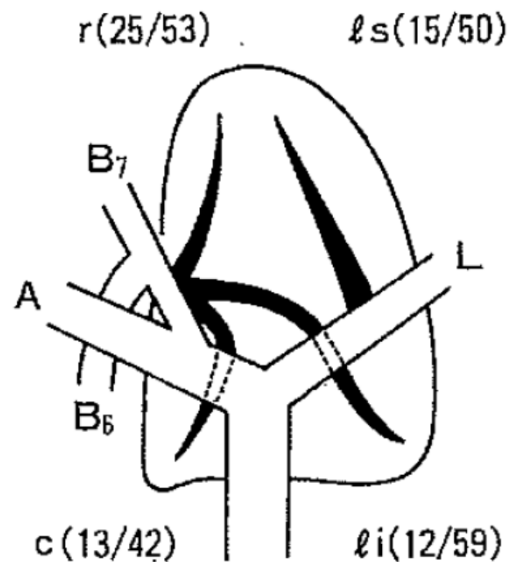
Based on 106 autopsy livers (dissection method)

Biliary anatomy of the S1 by Nimura (Nagoya Univ.)

(in Japanese, 1988 and in English, 1990)



Nimura showed another B1 anatomy based on cholangiogram, and found a frequent histologic involvement of B1 branches. He concluded that caudate lobe should be routinely resected for PCC.



Hepatectomy with caudate lobectomy for PCC

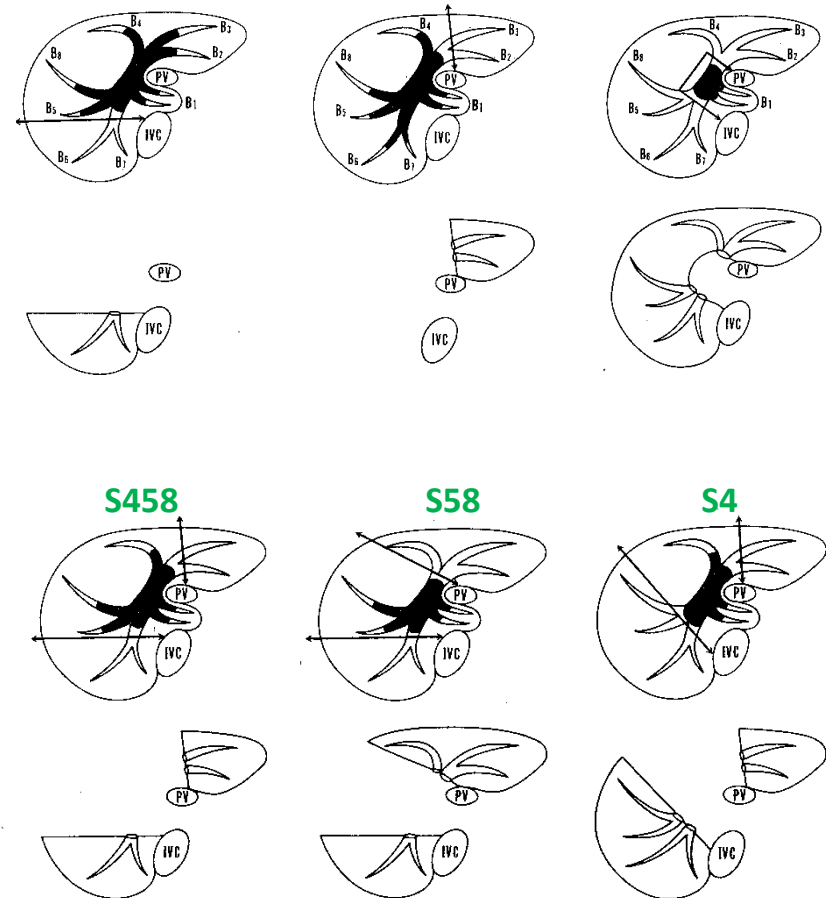
(Nimura, World J Surg 1990)

Nimura performed **11** types of hepatectomy with caudate lobectomy for PCC, which covers all conceivable hepatectomies for PCC.

Right-sided	Right trisectionectomy	5
	Extended right hepatectomy	3
	Right hepatectomy	6
Left-sided	Left trisectionectomy	4
	Extended left hepatectomy	15
	Left hepatectomy	2
Central type	Central bisectionectomy	2
	Segmentectomy 4	3
	Right anterior sectorectomy	1
Others	Right posterior sectorectomy	1
	Isolated caudate lobectomy	3
Total		45

All procedures included BDR and caudate lobectomy

Rt trisectionectomy **Lt trisectionectomy** **Isolated S1**



Summary

Caudate lobectomy for PCC

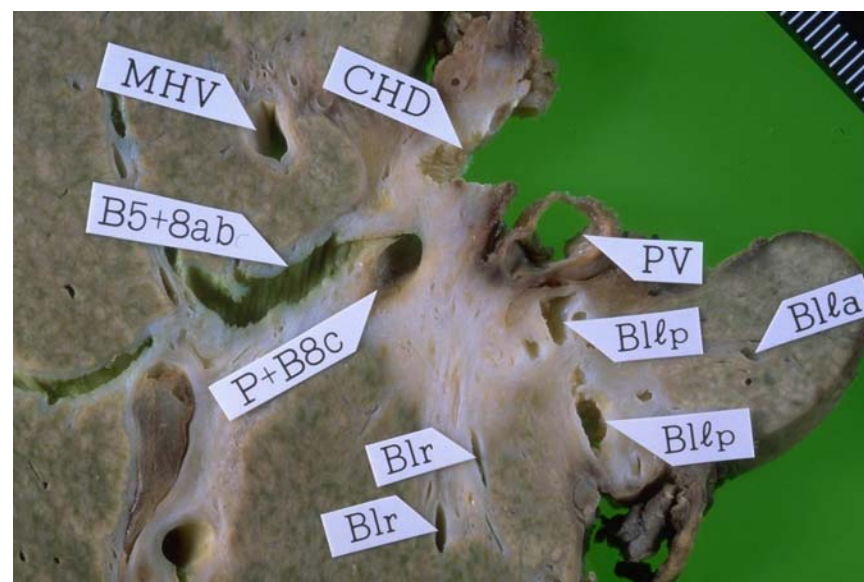
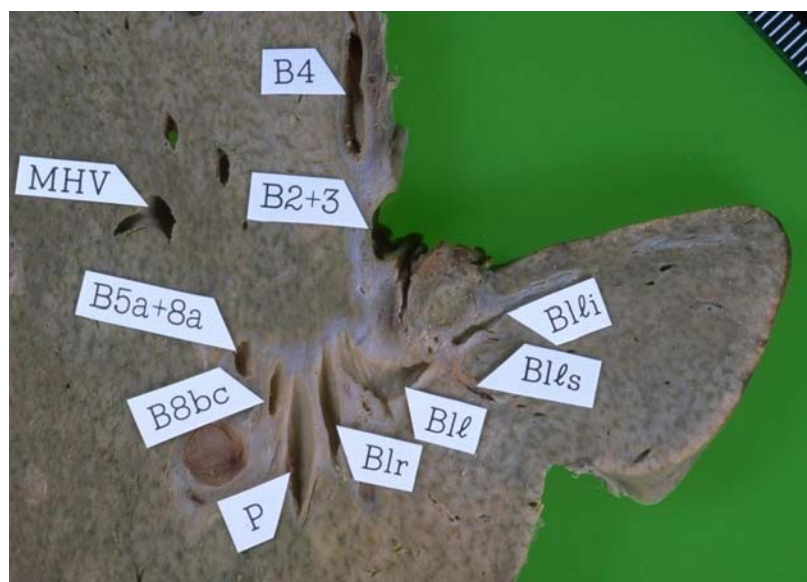
Japanese HBP surgeons

confirmed technical feasibility

showed own biliary anatomy of the caudate lobe

found frequent infiltration around the caudate lobe

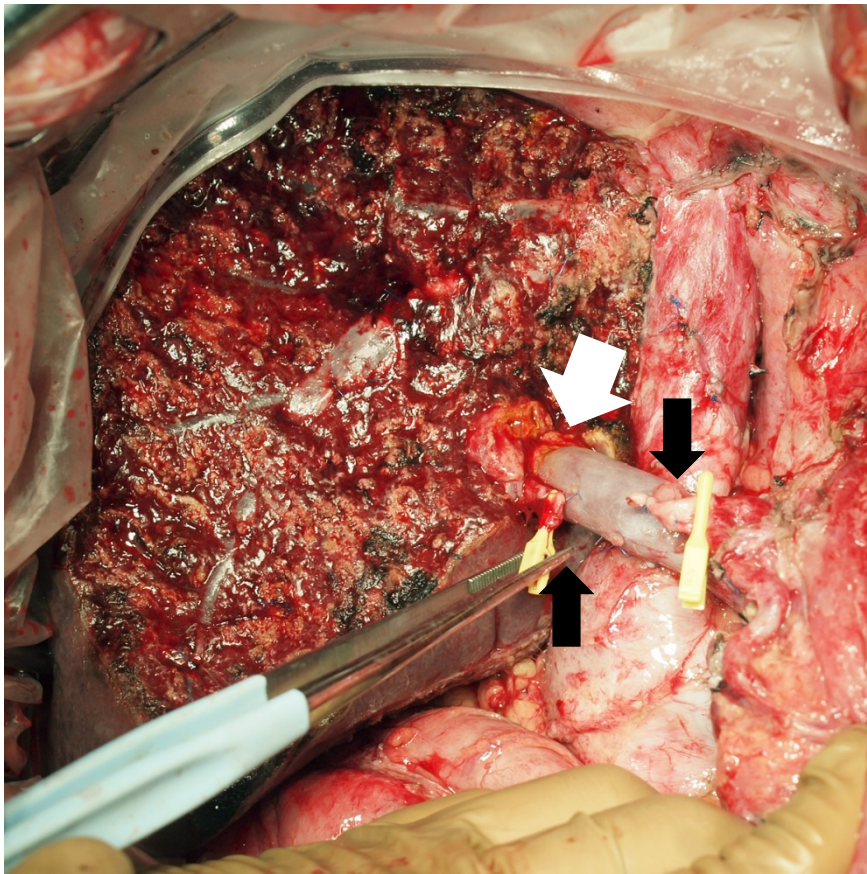
performed various types of hepatectomies combined with caudate lobectomy



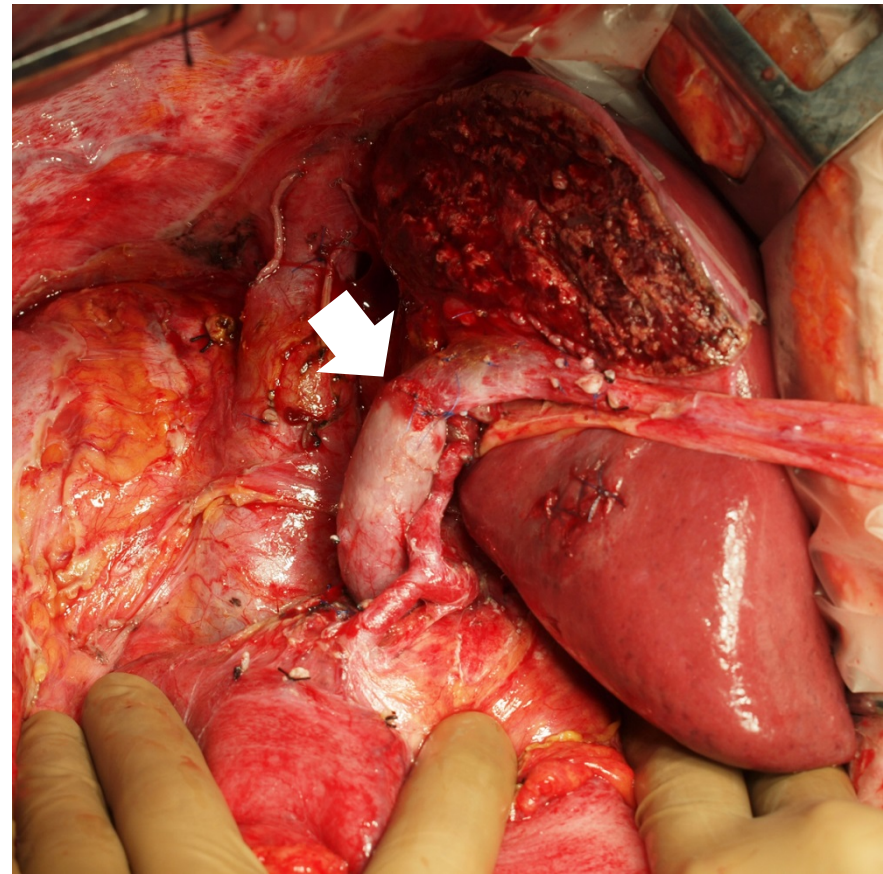
Resected specimen after right trisectionectomy

2. Hepatectomy with vascular resection

Left trisectionectomy +PV+ RHA



Right trisectionectomy +PV



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Hepatectomy with vascular resection

1965	Kajitani		Right hepatectomy	+PV	(n=1)	survival
1973	Longmire		Right trisectionectomy	+PV	(n=2)	survival
1974	Fortner		Major hepatectomy	+PV	(n=3)	all dead
1981	Tsuzuki		Left hepatectomy	+HAPV	(n=2)	survival
1984	Blumgart		Right trisectionectomy	+PV	(n=2)	survival
			Left hepatectomy	+PV	(n=1)	
1986	Sakaguchi		Right trisectionectomy	+PV	(n=8)	1 dead

Hepatectomy with vascular resection

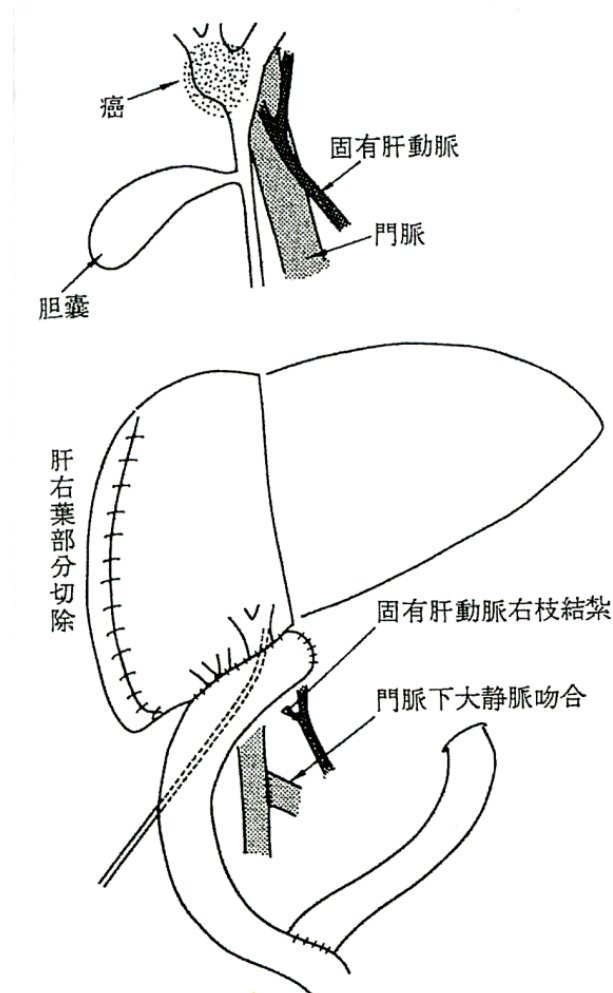
1965	Kajitani		Right hepatectomy	<u>+PV</u>	(n=1)	survival
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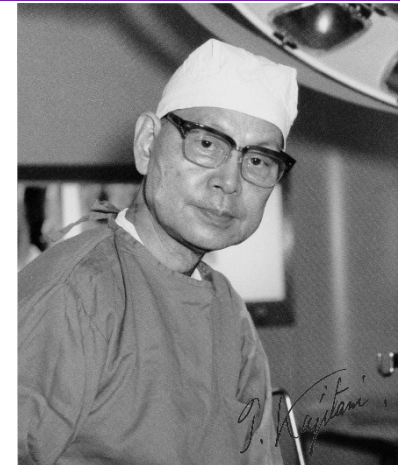
including first interposition graft for PV reconstruction

The world-first hepatectomy with PV resection by Tamaki Kajitani (Cancer Institute Hospital)

The RHA and portal bifurcation were involved.



Patient	50 year-old man
Date	Aug 6, 1965
Procedure	Right hepatectomy +BDR +PV Porto-caval shunt
Time	4 hr 2 min
Blood loss	4.3 L
Histology	Papillary adenocarcinoma
Course	Died of disease (3.9 years)



(梶谷環ら、肝門部胆管癌の手術治療. 手術 20, 997-1002, 1966)

The world-first hepatectomy with PV and HA resection by Toshiharu Tsuzuki (Keio Univ.)

RHA resection & reconstruction (n=2)



Interposition graft
with great saphenous vein



Transposition
of RGEA

PV resection & reconstruction (n=4)



Carcinoma of the Bifurcation of the Hepatic Ducts

Arch Surg 1983

Toshiharu Tsuzuki, MD; Yoshiro Ogata, MD; Shuhei Iida, MD;
Izumi Nakanishi, MD; Yoshihumi Takenaka, MD; Hiroshi Yoshii, MD

2 patients underwent left hepatectomy +PV+RHA
They survived surgery, and died of disease 1.5 years
after surgery.



Hepatectomy with vascular resection in 1990s

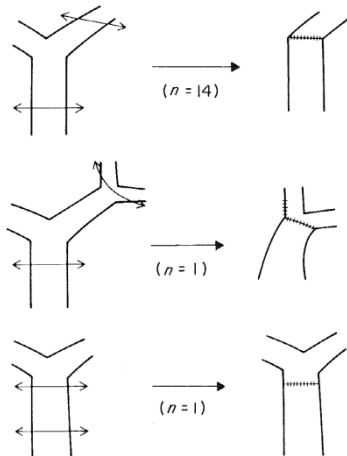
PV was the main target of vascular resection

1991	Nimura		PV (n=29)	First large series
1993	Tashiro		PV (n=6)	
1994	Sugiura		PV (n=18), HA (n=4)	Keio multi-center study
1996	Pichlmayer		PV (n=36), HA (n=1), PVHA (n=2)	
1997	Miyazaki		PV (n=34)	Left renal vein graft
1999	Neuhaus		PV (n=23)	Non-touch technique

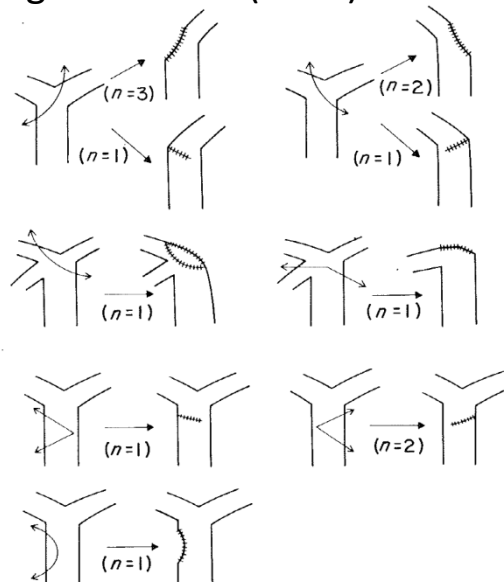
The First large series of hepatectomy with PV resection

Nimura Y. Combined portal vein and liver resection for carcinoma of the biliary tract. Br J Surg 1991

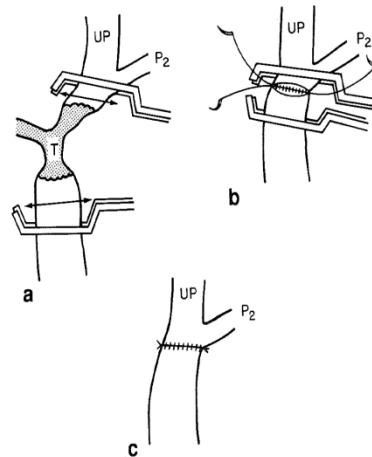
Segmental resection (n=16)



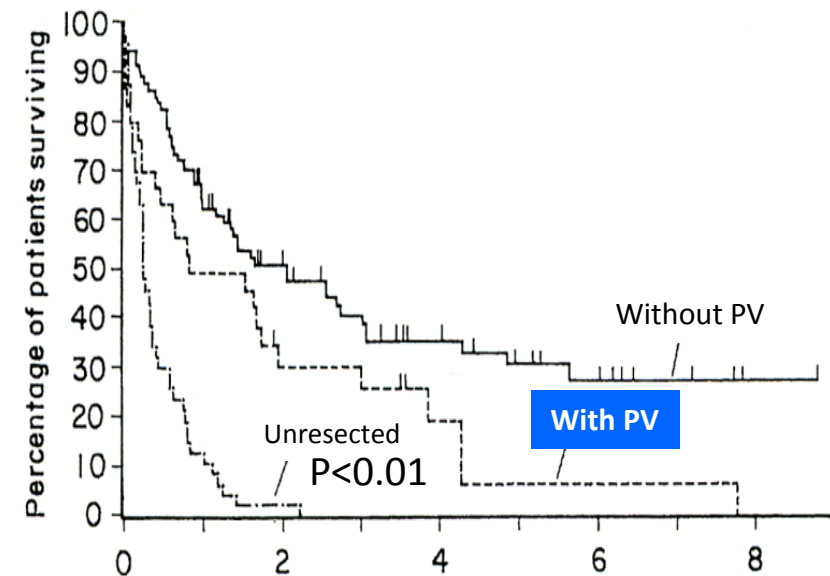
Wedge resection (n=13)



Reconstruction method



BDC (n=16); GBC (n=13)



Morbidity	66%
Mortality	17%
Survival rate	29% at 3 yrs; 6% at 5 yrs

Hepatectomy with vascular resection after 2000

2000	Lee		PV (n=29), HA (n=4)	
2001	Yamanaka		PV (n=5), HA (n=3), PVHA (n=7)	Feasibility of PVHA resection
2003	Ebata		PV (n=52)	10% survival rate at 5 years
2003	Shimada		PV (n=3), HA (n=6), PVHA (n=6)	Feasibility of PVHA resection
2006	Sakamoto		HA (n=11)	Safety of RHA resection
2006	Hemming		PV (n=26)	Utility of PV resection
2007	Miyazaki		PV (n=34), HA (n=2), PVHA (n=7)	Risk of PVHA resection
2010	Nagino		PVHA (n=50)	30% survival rate at 5 years

Summary

Hepatectomy with vascular resection

- Resection of the PV or HA was first performed in Japan.
- Subsequent Japanese challenges have confirmed the utility of vascular resection.
- Vascular resection expands the surgical indication against locally advanced BTC.

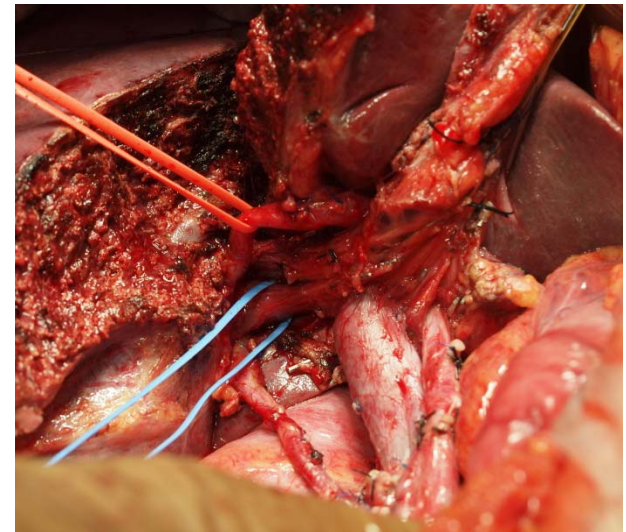
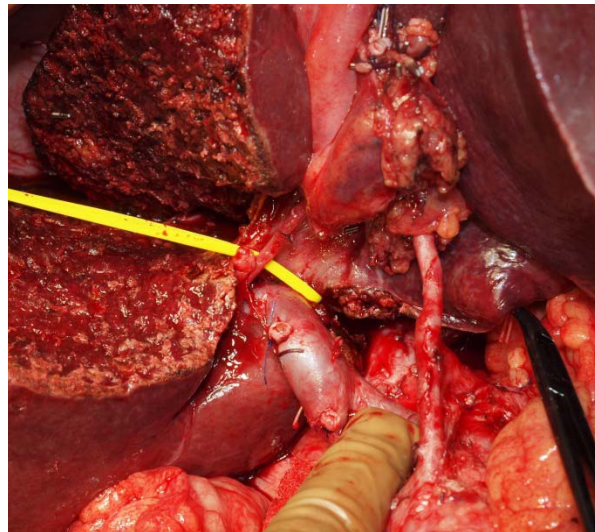
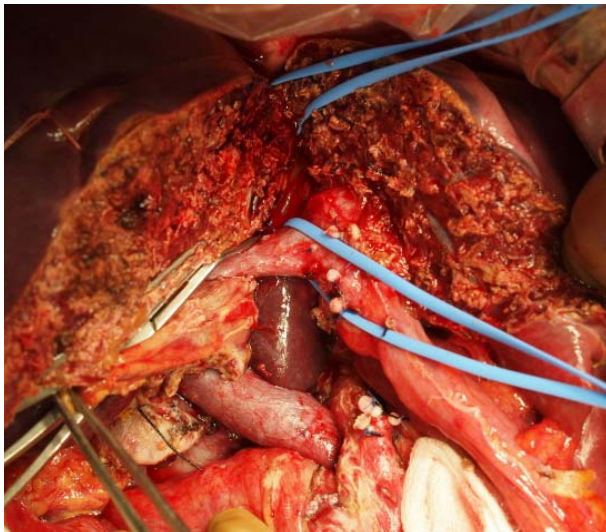
PV resection alone



RHA resection alone

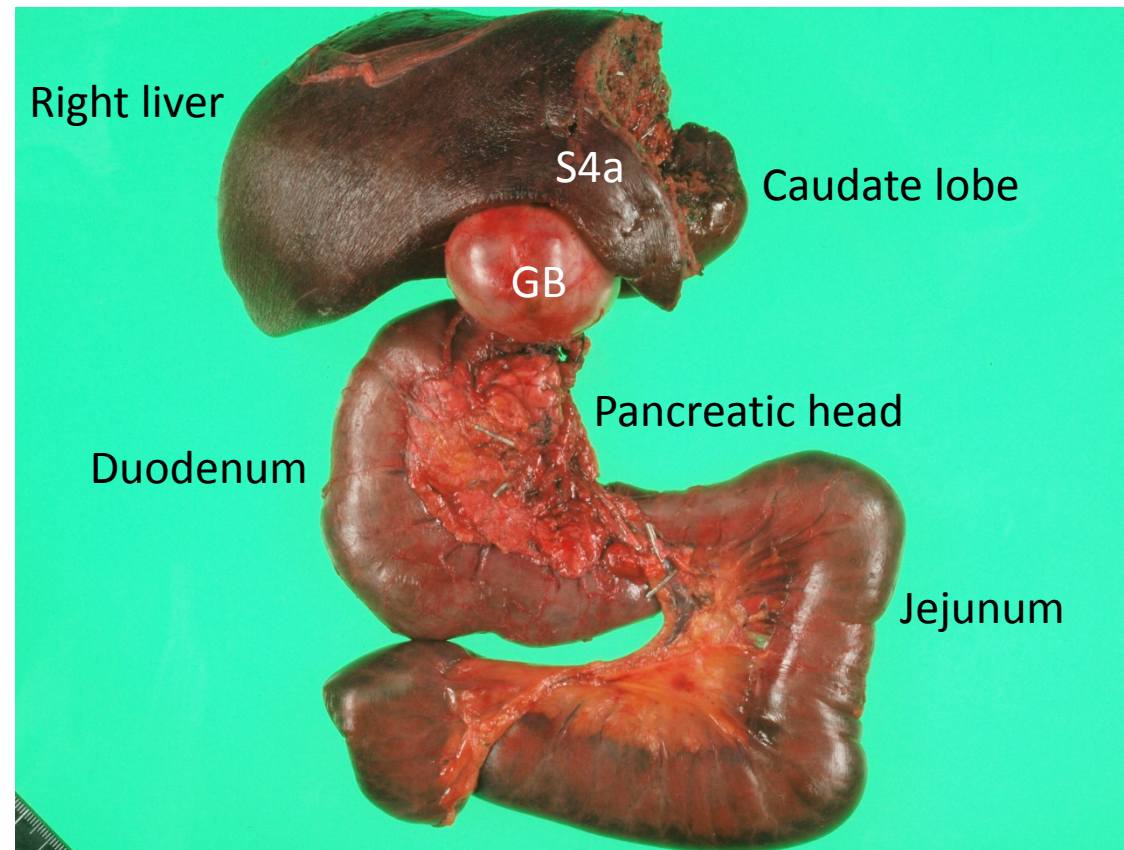


PV and RHA resection



3. Hepatopancreatoduodenectomy (HPD)

HPD is the most extensive procedure in the biliary field, which removes the entire extrahepatic biliary tree with the surrounding organs.



HPD for GBC with bile duct invasion

Initial challenges of HPD in Japanese literatures (1970s – 1980s)

Year	Author	Disease	N	Major Hx	PV	Mortality
1976	Kasumi F ¹	GBC	1	1	0	0
1980	Takasaki K ²	GBC	5	5	0	3 (60%)
1982	Sugiura Y ³	GBC	8	8	3	5 (63%)
1983	Nakamura S ⁴	GBC	2	2	1	0
1985	Nimura Y ⁵	GBC/BDC	5/1	6	0	-
1987	Sugiura Y ⁶	GBC	16	16	7	6 (38%)
1987	Nimura Y ⁷	GBC	10	8	5	2 (20%)
1988	Hanyu F ⁸	GBC	3	3	3	1 (33%)

1, 霞富士夫ら, 日消外会誌9:170-7, 1976; 2, 高崎健ら, 胆と膵1, 923-32, 1980; 3, 杉浦芳章ら, 日消外会誌15, 1631-35, 1982
 4, 中村達ら, 日消外会誌161, 601-6, 1983; 5, 二村雄次ら, 手術39, 297-304, 1985; 6, 杉浦芳章ら, 日外会誌88, 1332-35, 1987
 7, 二村雄次ら, 日外会誌88, 1343-46, 1987; 8, 羽生富士夫ら, 外科治療59, 12-21, 1988

First successful HPD in the world

(1974 at Cancer Institute Hospital, Japan)

胆嚢癌の治療，とくに進展様式からみた治療方針

癌研外科
霞 富士雄 高 木 国 夫
東大第2外科
小 西 敏 郎
癌研病理
坂 元 吾 偉

They reported surgical result of 11 GBC-patients,
one of whom underwent Hx with PD.

(日消外会誌 9: 170-177, 1976)

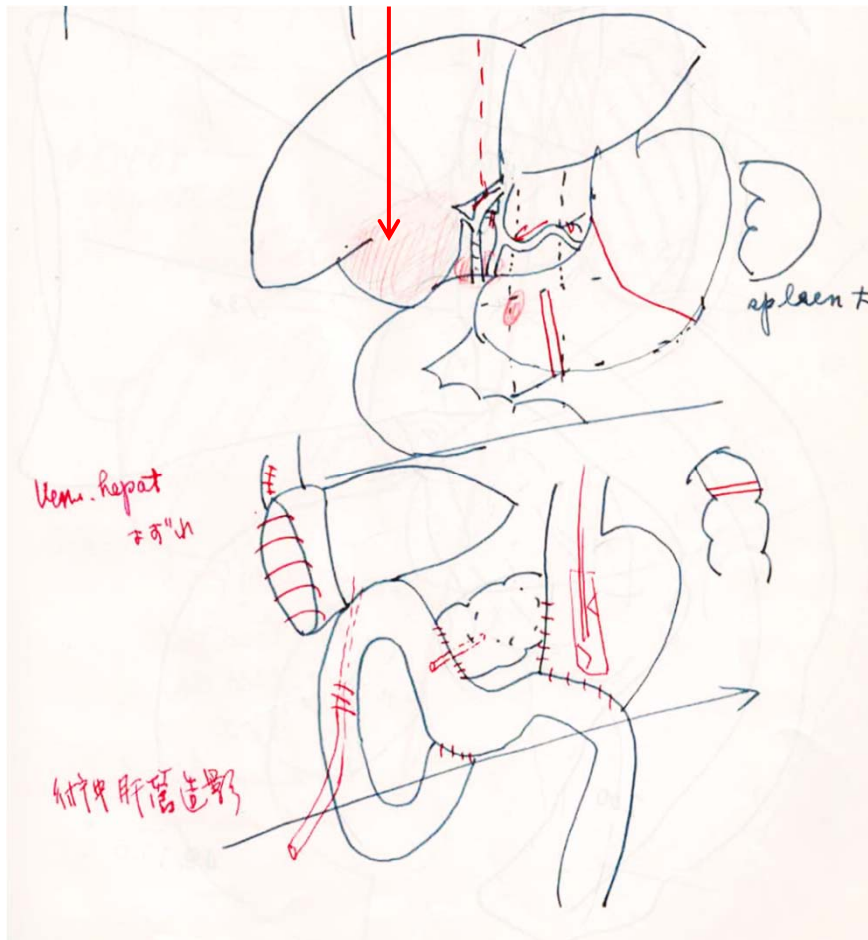
問 題 点

				liver	Ind.	others
1. 53	肝部切 廓清	良く被包された leiomyo Sa. 10×9×8	6年生存中			
2. 68	胆膵 廓清	胆嚢管 Ind ⊙. s.s. (主 LPM) 乳頭型 Ca 5.0×4.0	6年5月			
3. 69	肝部切 結腸切 総胆管切石	乳頭型 Ca 2.5×2.5 M.L. meta	2年2月			
4. 51	肝部切 廓清	傍総胆管 Ind 卵大 胆管・門脈と adh. 刺す	1年8月		+	
5. 74	肝部切 廓清 胃切 結腸切	12×10×7 肝床 tumor 近い. <3 mm	1年3月	+		
6. 67	胆膵 胃十二指腸切 結腸切	Ind (H) pylorusへ浸	1年1月		+	+
7. 58	胆膵	結節型 Ca 1.4×1.4 s.s. 肝床 tumor 残る?	10月	+	+	
8. 62	胆膵 廓清 総胆管切 P.D.	び慢型 Ca S ⊙ tumor 残る? lig hep duod へ浸	7.5月	+		+
9. 66	胆膵 廓清 総胆管切	両肝管断端 tumor 近い <2 mm	7月			+
10. 62	肝部切 廓清 胃切 結腸切	9×8×8 肝床 tumor 近い <3 mm	7月	+		
11. 68	肝右葉切 廓清 総胆管切 P.D.	9×9×5 squamous 拡大肝右葉切せず para aorta (・) とる.	4月	+	+	



A 68 year-old man with advanced gallbladder cancer

Bulky GBC (9cm) directly
invades the liver and duodenum



Date : July 12, 1974
Drs : Keihiro Kuno, Hori, and Konishi
Procedure : Right Hx + PD (HPD)
Time : 6 hr 25 min
Blood loss : 3270 mL
Pathology : Squamous cell carcinoma
Outcome : Died of disease (Dec 19, 1974)

(provided by Drs. Takahashi and Saiura, Cancer Institute Hospital, Tokyo)

Our experiences (5 cases) of extended right lobectomy combined with pancreatoduodenectomy for GBC

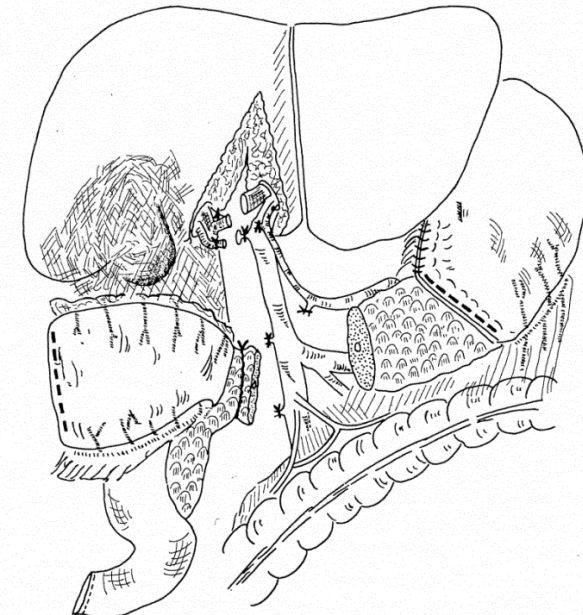
拡大肝右葉切除兼膵頭十二指腸切除により切除し得た胆嚢癌5例の検討
高崎健ら, 胆と膵 1, 923-932, 1980

Ken Takasaki
(Tokyo Women's Medical University)



	Age	Tumor size (cm)	Cause of additional PD	Course
1.	59	3	#12, 13 → panc	Discharge
2.	64	9	#12, 13 → panc	Dead (D30)
3.	57	6	#12, 13 → panc	Dead (D12)
4.	65	9	#12, 13 → panc	Dead (D3)
5.	46	11	#12 → panc/pv	Discharge

60% mortality



The following challenge during 1990s in English literatures

Year	Author	Disease	No.	Major Hx	Mortality	MST(months)
1991	Nimura ⁹⁾	GBC	14	17 (71%)	6 (25%)	GBC 12
		BDC	10			BDC 5
1994	Tsukada ¹⁰⁾	GBC	2	7 (100%)	2 (29%)	NA
		BDC	5			
1994	Nakamura ¹¹⁾	GBC	7	4 (57%)	0	12
1996	Miyagawa ¹²⁾	GBC	3	9 (90%)	0	NA
		BDC	7			

⁹⁾ Nimura Y et al, Hepatogastroenterology 38: 170-5,1991; ¹⁰⁾ Tsukada K et al, Br J Surg 81: 108-10,1994

¹¹⁾ Nakamura S et al, Arch Surg 129: 625-9,1994; ¹²⁾ Miyagawa S et al, World J Surg 20: 77-80,1996

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1994	Tsukada K ¹⁰⁾	GBC BDC	2 5	7 (100%)	2 (29%)	NA
1994	Nakamura S ¹¹⁾	GBC	7	4 (57%)	0	12
1996	Miyagawa S ¹²⁾	GBC BDC	3 7	9 (90%)	0	NA

⁹⁾ Nimura Y et al, Hepatogastroenterology 38: 170-5,1991; ¹⁰⁾ Tsukada K et al, Br J Surg 81: 108-10,1994

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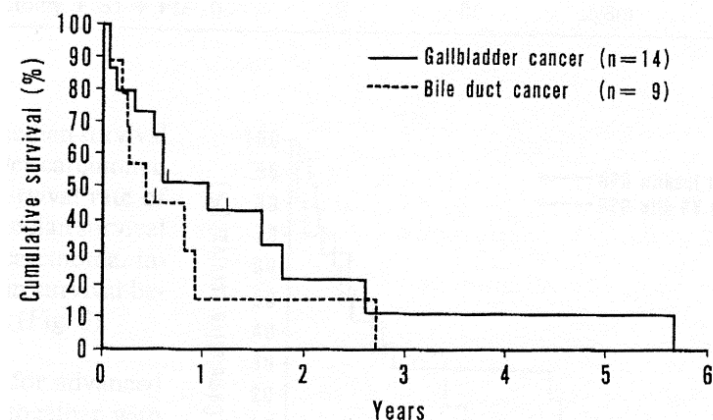
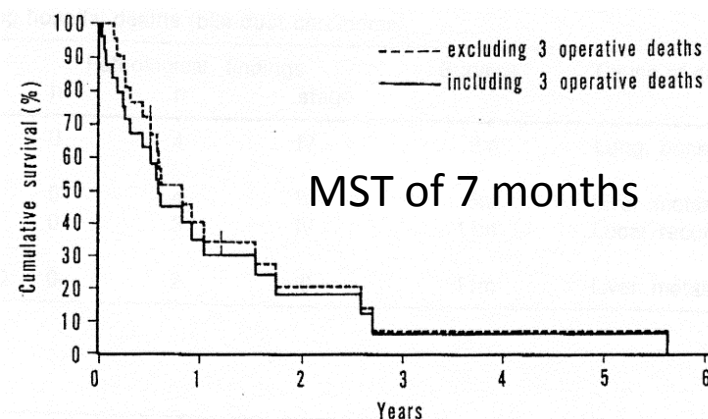
Surgical result after HPD by Nimura (1991)

(Hepatogastroenterology 38: 170-175, 1991)

Hepatectomy	Total	Number of patients combined resection		
		PV	IVC	colon
Right trisegmentectomy + S1	5	4		1
Left trisegmentectomy + S1	1			
Extended right lobectomy + S1	7	5	1	1
Extended left lobectomy + S1	1			
Central bisegmentectomy + S1	1			
Extended right lobectomy	1	1		
Right lobectomy + S1	1	1		
S4a56	3			3
S4a5	2			1
S4+(S3)	1			
S1	1			
Total	24	11	2	5

S1: caudate lobe resection, S4a56: Medial inferior, anterior inferior and posterior inferior hepatic segmentectomy, S4a5: Medial inferior and anterior inferior hepatic segmentectomy, S4+(S3): Medial hepatic segmentectomy and partial hepatectomy of the lateral anterior segment, PV: Portal vein, IVC: Inferior vena cava

Mortality: 25% (6/24)



GBC: 12 months

BDC: 5 months

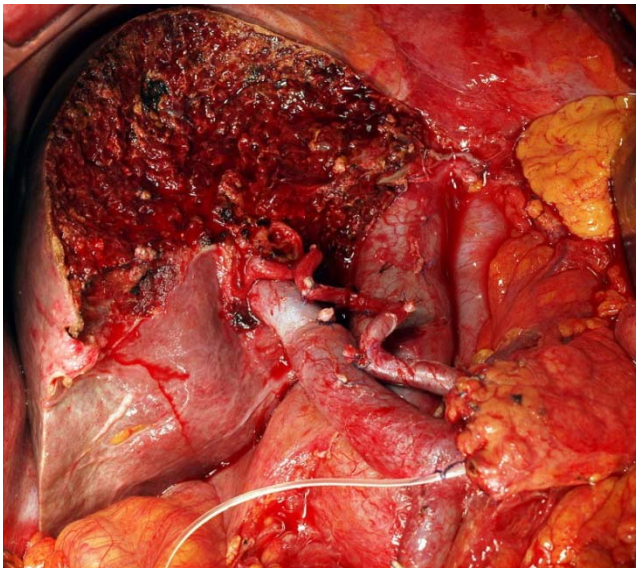
Surgical results of HPD after 2000

Mortality reduced gradually. Survival rates at 5 years were 0-25% in GBC and 12-64% in BDC.

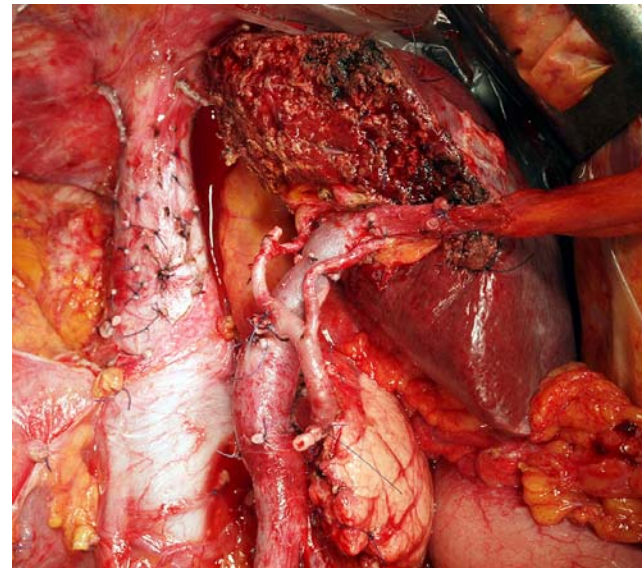
Year	Author		Disease	No.	Major Hx	Mortality	Survival rate at 5 years
2001	Yoshimi F		GBC	13	8 (62%)	1 (8%)	12%
2007	Miwa S		GBC BDC	9 17	22 (85%)	0	GBC 25% BDC 52%
2007	Kaneoka Y		GBC BDC	10 10	20 (100%)	3 (15%)	GBC 0% BDC 64%
2008	Wakai T		GBC BDC	11 17	28 (100%)	6 (21%)	GBC 9% BDC 12%
2010	Kaneoka Y		BDC	14	13 (93%)	0	50%
2010	Hemming AW		GBC BDC	9 13	NA	0	GBC 24% BDC 18%
2012	Ebata T		BDC	85	79 (93%)	2 (2%)	37%
2012	Lim CS		GBC BDC	10 13	23 (100%)	3 (13%)	GBC 10% BDC 32%
2013	Sakamoto Y		GBC BDC	5 14	19 (100%)	1 (5%)	GBC 0% BDC 45%

Summary of HPD

- HPD, originated in Japan, has been employed mainly in Japan even now.
- The morbidity and mortality are still high, although gradually improved.
- Long-term survival can be expected, particularly in BDC-patients.



Left trisectionectomy + PD

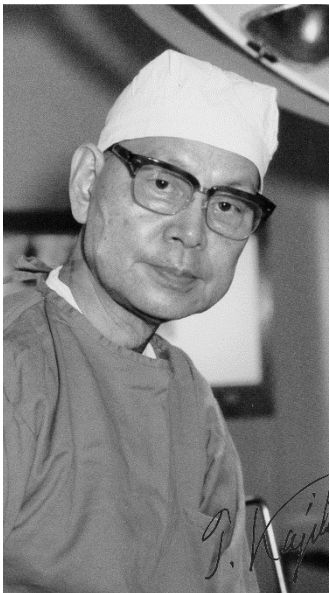


Right trisectionectomy + PD

Conclusion

- Caudate lobectomy for perihilar cholangiocarcinoma (PCC)
- Hepatectomy combined with vascular resection
- Hepatopancreatoduodenectomy (HPD)

Japanese HBP surgeons greatly contributed to initiation, promotion, and standardization of extended resections for BTC.



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**第6回アジア・太平洋肝胆膵学会
第29回日本肝胆膵外科学会学術集会
COI 開示**

筆頭発表者名： 江畑 智希

**私の今回の演題に関して
開示すべきCOIは、ありません。**

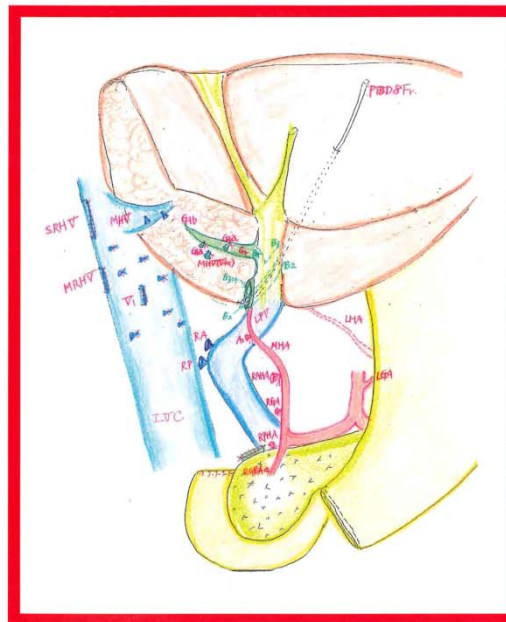
Postscript

胆道癌の外科

世界制覇への軌跡

著 二村 雄次

編集協力 特定非営利活動法人 名古屋外科支援機構



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