


Pylorus Preserving Pancreaticoduodenectomy: Superior to Classic Pancreaticoduodenectomy

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Pancreatic Cancer

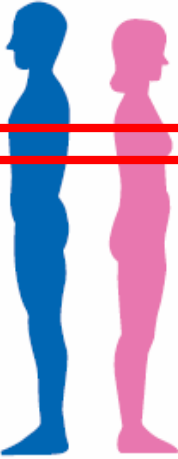
Estimated New Cases*

			Males	Females			
Prostate	192,280	25%		Breast	192,370	27%	
Lung & bronchus	116,090	15%		Lung & bronchus	103,350	14%	
Colon & rectum	75,590	10%		Colon & rectum	71,380	10%	
Urinary bladder	52,810	7%		Uterine corpus	42,160	6%	
Melanoma of the skin	39,080	5%		Non-Hodgkin lymphoma	29,990	4%	
Non-Hodgkin lymphoma	35,990	5%		Melanoma of the skin	29,640	4%	
Kidney & renal pelvis	35,430	5%		Thyroid	27,200	4%	
Leukemia	25,630	3%		Kidney & renal pelvis	22,330	3%	
Oral cavity & pharynx	25,240	3%		Ovary	21,550	3%	
Pancreas	21,050	3%		Pancreas	21,420	3%	
All Sites	766,130	100%		All Sites	713,220	100%	

- Relatively infrequent diagnosis
- 2nd most common GI malignancy
- Equally common among males/females

Pancreatic Cancer

Estimated Deaths

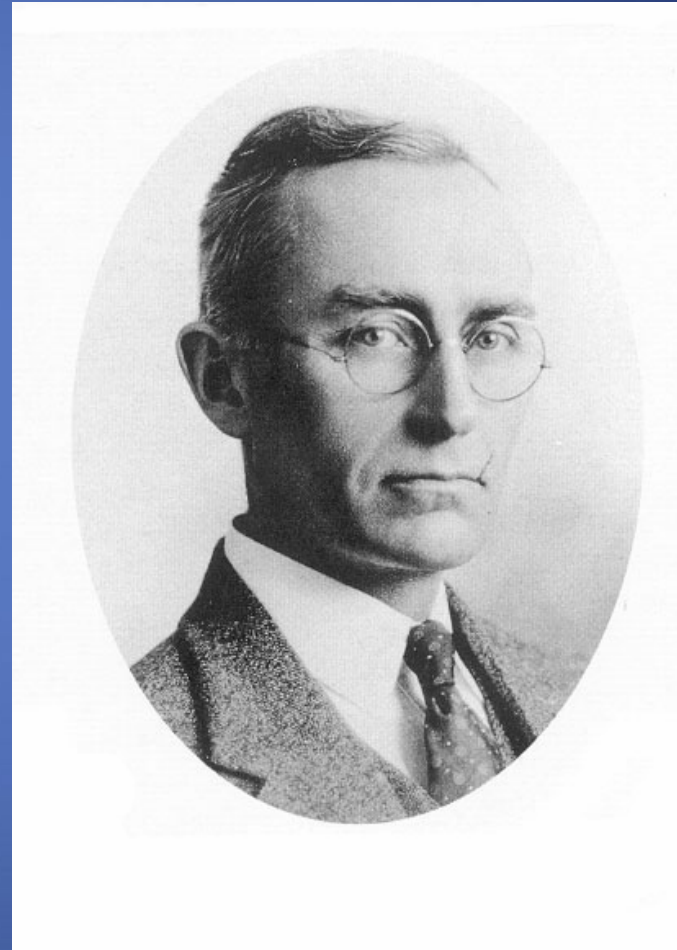
		Males		Females		
Lung & bronchus	88,900	30%		Lung & bronchus	70,490	26%
Prostate	27,360	9%		Breast	40,170	15%
Colon & rectum	25,240	9%		Colon & rectum	24,680	9%
Pancreas	18,030	6%		Pancreas	17,210	6%
Leukemia	12,590	4%		Ovary	14,600	5%
Liver & intrahepatic bile duct	12,090	4%		Non-Hodgkin lymphoma	9,670	4%
Esophagus	11,490	4%		Leukemia	9,280	3%
Urinary bladder	10,180	3%		Uterine Corpus	7,780	3%
Non-Hodgkin lymphoma	9,830	3%		Liver & intrahepatic bile duct	6,070	2%
Kidney & renal pelvis	8,160	3%		Brain & other nervous system	5,590	2%
All Sites	292,540	100%	All Sites	269,800	100%	

- Very high mortality
- 3% 5-year survival all comers
- 10-20% 5-year survival after resection
- Median Survival approx. 24 months

Jemal et al, CA: Cancer J Clin, 2009

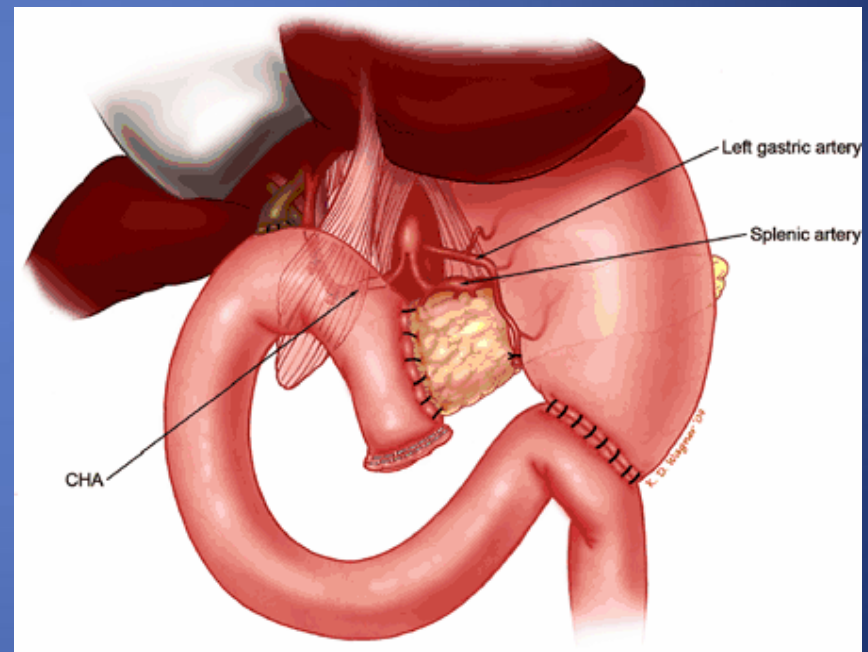
Pancreaticoduodenectomy

- Surgical treatment for periampullary tumors
- 1st successful performed by AO Whipple
 - 2 stage operation:
 - Biliary diversion and gastrojejunostomy
 - Resection of duodenum and pancreatic head
 - High mortality (30%)



Pancreaticoduodenectomy

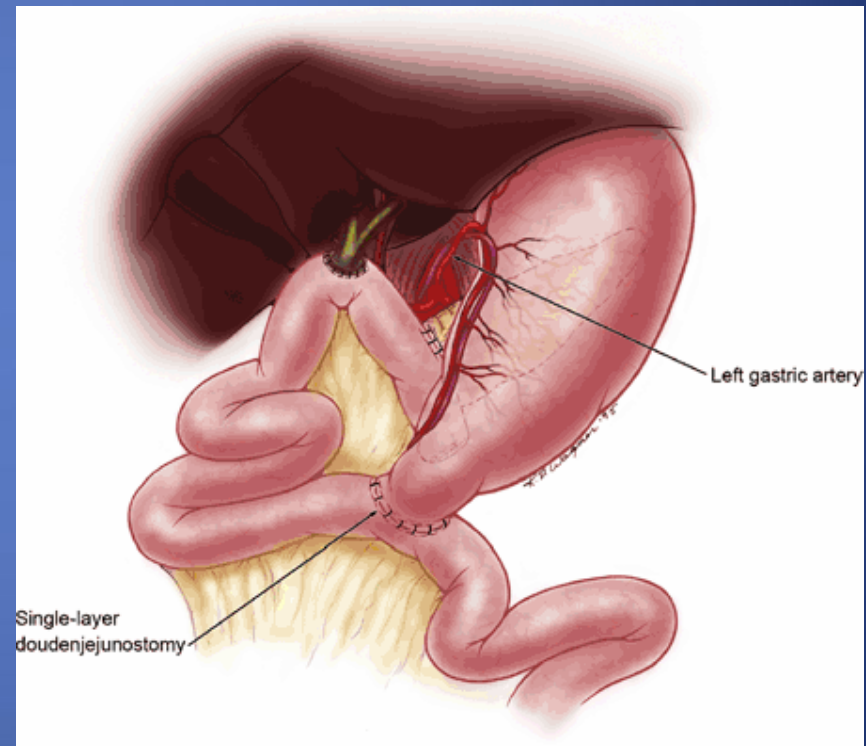
- Several Modifications
 - Choledochojejunostomy 1941 (Trimble, Hunt)
 - Pancreicojejunostomy 1941 (Hunt)
 - Distal gastrectomy, 1942 (Trimble, Pearse)
 - Gastroenterostomy distal to biliary and pancreatic anastomoses, 1948 (Owens)
 - Various degrees of gastrectomy, 1950s-1970s



Pearlman *et al*, Arch Surg, 1986

Pylorus Preservation

- First reported by Watson (1944)
- Reintroduced by Traverso (1978)
- Improvement in GI function
 - Dumping & malnutrition
- Prevention of jejunal ulceration
- Shorter operating time

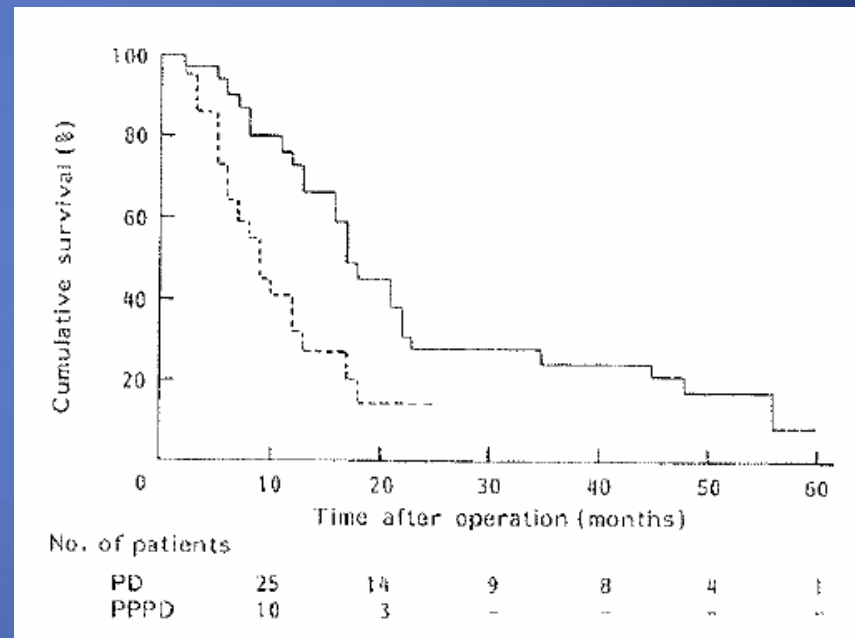


What is the debate?

- Pro Pancreaticoduodenectomy (PD)
 - Better oncologic resection
 - Retrieval of LN
 - Duodenal margin
 - Less DGE
 - No difference in operative morbidity or mortality
- Pro Pylorus Preserving Pancreaticoduodenectomy (PPPD)
 - Lower frequency of marginal ulceration
 - Shorter operative time and less blood loss
 - Better gastrointestinal function/weight gain
 - Better quality of life

Survival

- Roder *et al*, *Br J Surg*, 1992
- Retrospective review 110 pts
 - Pancreatic (n=53) or periampullary (n=57) cancer
 - 62 pts PD, 48 pts PPPD
 - Similar percentage R₀ resection
 - Similar stage of tumors
 - Similar patient characteristics



Lower 5-year survival for PPPD

Randomized-Controlled Trials

Author	Journal	Year	PD (n)	PPPD (n)	Indication
Paquet	<i>Chirurgische Gastroent...</i>	1998	23	17	Pancreatic or periamp. CA
Bloechle	<i>Deutsche Gesellshaf...</i>	1999	23	21	“Periampullary carcinoma”
Wenger	<i>Chirurg</i>	1999	24	24	Pancreatic or periamp. CA
Lin	<i>Br J Surg</i>	1999	15	16	Pancreatic or periamp. CA
Tran	<i>Ann Surg</i>	2004	83	87	Pancreatic or periamp. CA
Seiler	<i>Br J Surg</i>	2005	66	64	Pancreatic or periamp. CA

Pylorus Preserving Pancreaticoduodenectomy Versus Standard Whipple Procedure

A Prospective, Randomized, Multicenter Analysis of 170 Patients With Pancreatic and Periapillary Tumors

Khe T. C. Tran, MD, Hans G. Smeenk, MD,* Casper H. J. van Eijck, MD, PhD,* Geert Kazemier, MD,* Wim C. Hop, MSc, PhD,* Jan Willem G. Greve, MD, PhD,† Onno T. Terpstra, MD, PhD,‡ Jan A. Zijlstra, MD,§ Piet Klinkert, MD,§ and Hans Jeekel, MD, PhD**

- Multicenter Trial (Netherlands)
- 170 pts over 9 consecutive years
- Suspected periampullary or pancreatic head CA
- Presumed resectable (CT/MRI)
- Exclusion Criteria:
 - Previous gastric resection
 - Distant metastases
 - Locally advanced
 - Pylorus or stomach
 - Peripyloric lymph nodes

Patient Characteristics

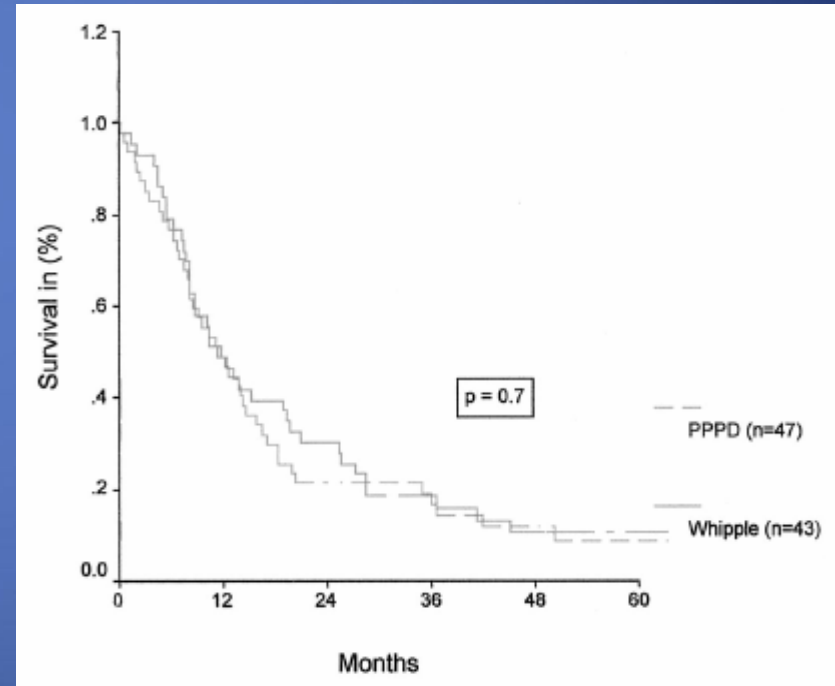
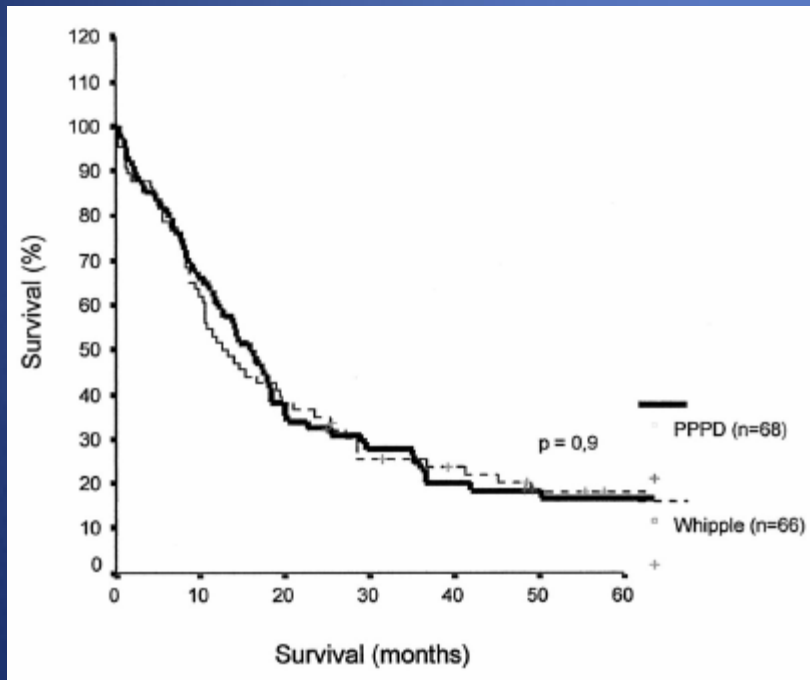
Patient Characteristics*	SW (n = 83)	PPPD (n = 87)	<i>P</i> Value
Age (y)	62 (27–78)	64 (43–78)	0.269
Gender, male/female	50/37	58/25	0.112
Weight preoperative (kg)	70.6 (46–102)	70.0 (43–110)	0.717

SW, standard Whipple; PPPD, pylorus-preserving pancreaticoduodenectomy.
*Data given are number of patients or median (range).

Incidence of DGE similar

Results cont.

- Overall 5-year survival
- Panc. adenocarcinoma 5-year survival



No difference in 5-year survival

Randomized clinical trial of pylorus-preserving duodenopancreatectomy *versus* classical Whipple resection – long term results

C. A. Seiler, M. Wagner, T. Bachmann, C. A. Redaelli, B. Schmied, W. Uhl, H. Friess and M. W. Büchler

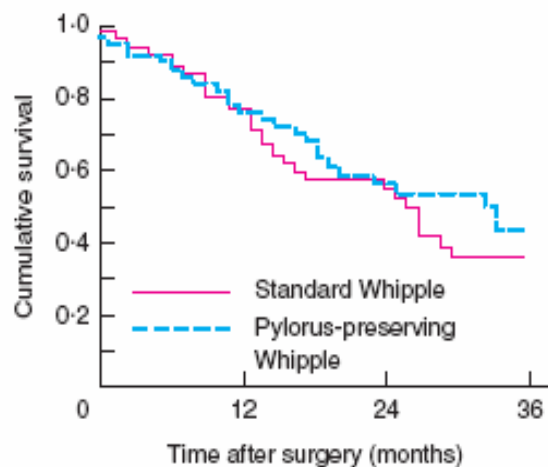
- Single Center Trial (Germany)
- 130 pts over approx. 5.5 consecutive years
- Suspected periampullary or pancreatic head CA
- Presumed resectable (CT/MRI)
- Exclusion Criteria:
 - Previous gastric resection
 - Distant metastases
 - Locally advanced
 - Pylorus or stomach
 - Peripyloric lymph nodes
 - Emergency surgery

Patient Characteristics

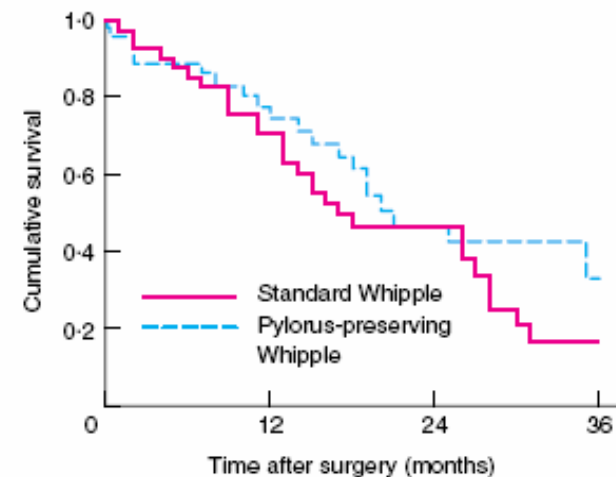
	Total (n = 214)	Standard Whipple (n = 109)	Pylorus-preserving Whipple (n = 105)	P
Men	123 (57.5)	57 (52.3)	66 (62.9)	0.173§
Women	91 (42.5)	52 (47.7)	39 (37.1)	0.173§
Age (years)*	64.9 (26–86)	65.4 (33–86)	65.4 (26–83)	0.450¶
ASA grade				
I–II	149 (69.6)	73 (67.0)	76 (72.4)	0.258§
III–IV	65 (30.4)	36 (33.0)	29 (27.6)	0.258§
Bodyweight (%)*†	93.4 (75–100)	93.4 (75–100)	93.0 (80–100)	0.125¶
Duration of symptoms (weeks)*	8.0 (0–200)	8.0 (1–200)	6.0 (1–180)	0.357¶
Diabetes	37 (17.3)	20 (18.3)	17 (16.2)	0.556§
Cardiac disease	32 (15.0)	19 (17.4)	13 (12.4)	0.761§
COAD	22 (10.3)	8 (7.3)	14 (13.3)	0.184§
Jaundice‡	57 (26.6)	31 (28.4)	26 (24.8)	0.480§
Albumin < 30 g/l	31 (14.5)	18 (16.5)	13 (12.4)	0.331§
Creatinine > 150 mmol/l	11 (5.1)	5 (4.6)	6 (5.7)	0.781§

Results cont.

- Overall 5-year survival
- Panc. adenocarcinoma 5-year survival



No. at risk	0	12	24	36
Standard Whipple	57	41	23	9
Pylorus-preserving Whipple	53	36	20	9



No. at risk	0	12	24	36
Standard Whipple	43	29	14	3
Pylorus-preserving Whipple	37	25	11	5

No difference in 3-year survival

Operative Time/Blood Loss

- Klinkenbijl *et al*, *Ann Surg*, 1992
 - Retrospective Rev. 91 pts
 - PD=44, PPPD=47
 - Equal pt/tumor characteristics

	PD	PPPD	<i>p</i>
EBL (ml)	2500 (1400-3600)	1800 (850-3050)	<0.05
Op. time (min)	255 (180-355)	210 (160-270)	<0.05

Characteristic	Treatment	
	PPPD	Whipple
Gender		
Men	30 (64%)	27 (61%)
Women	17 (36%)	17 (39%)
Age (yr)	62 (41-79)	60 (27-78)
Localization		
Head	26 (55%)	24 (55%)
Periampullary	21 (45%)	20 (45%)
T stage		
T1	9 (19%)	13 (29%)
T2	34 (72%)	24 (55%)
T3	4 (9%)	7 (16%)
N stage		
NO	34 (74%)	28 (65%)
N1a	12 (26%)	15 (35%)

Operative Time/Blood Loss RCTs

- Tran *et al*

	PD	PPPD	<i>p</i>
EBL (L)	2.0 (0.3-9.5)	2.0 (0.4-21.0)	=NS
Op. time (min)	300 (160-480)	300 (130-600)	=NS

- Seiler *et al*

	Total (<i>n</i> = 130)	Standard Whipple (<i>n</i> = 66)	Pylorus-preserving Whipple (<i>n</i> = 64)	<i>P</i>
Operating time (min)	410 (240-780)	449 (240-780)	382 (240-645)	0.001
Blood loss (ml)	1230 (400-6000)	1500 (400-6000)	1198 (400-4000)	0.041
Blood replacement (units)	1.9 (0-10)	1.9 (0-10)	0.9 (0-6)	0.047
ICU stay (days)	1.8 (1-11)	1.8 (1-11)	1.8 (1-5)	0.878
Hospital stay (days)	20.1 (8-67)	20.8 (8-67)	19.7 (10-61)	0.797

Complications Tran *et al*

Complications	SW (n = 83)	PDDD (n = 87)	P Value
Pancreatic fistula	12 (14%)	11 (13%)	
GE leakage	2 (1%)	0	
Bile leakage	0	2 (2%)	0.528
Postoperative bleeding	6 (7%)	6 (7%)	0.933
Intra-abdominal abscess	8 (10%)	9 (10%)	0.878
Other complications	23 (28%)	19 (22%)	0.375
Relaparotomy	16 (19%)	13 (15%)	0.479
Mortality*	6 (7%)	3 (3%)	0.270

SW, standard Whipple; PPPD, pylorus-preserving pancreaticoduodenectomy.
*Operative mortality within 30 d.

Outcome	SW	PPPD	P Value
Days of nasogastric intubation	5 (1–48) [83]	6 (1–57) [87]	0.835
Days until regular diet tolerated orally	10 (0–54) [83]	10 (0–58) [87]	0.574
Delayed gastric emptying*	18 (23%) [80]	19 (22%) [85]	0.800
Hospital stay, days	20 (11–138) [67]	18 (4–173) [74]	0.488
Body weight on discharge (kg)	67 (44–92) [67]	65 (41–98) [74]	0.789
Pre-illness body weight (kg)	75 (53–92) [75]	79 (50–120) [76]	0.571
Preoperative body weight (kg)	71 (46–102) [77]	70 (46–102) [81]	0.764

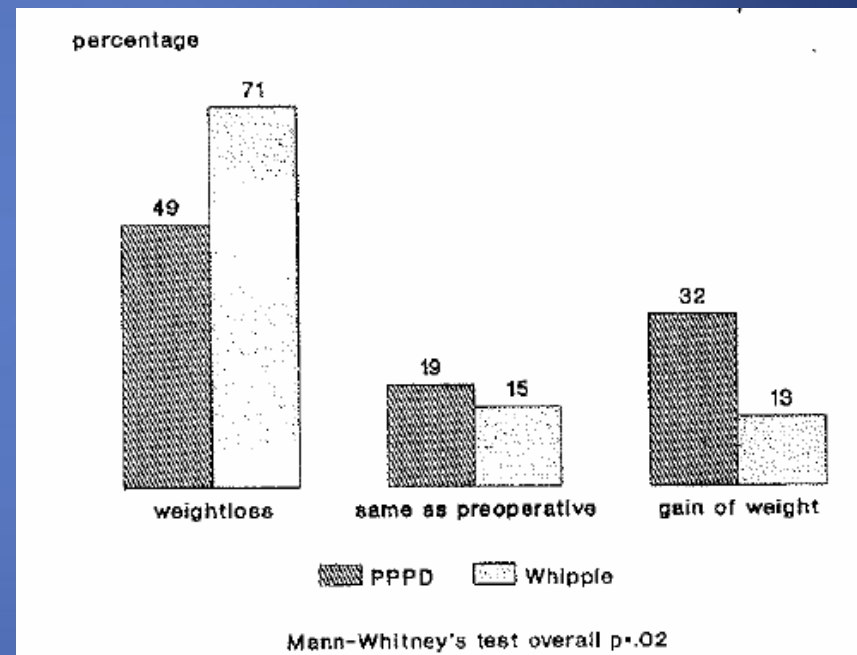
*Delayed gastric emptying is defined as nasogastric suction for 10 d or more, or diet on or before the 14th postoperative day. Data given are median (range) or number of patients. Data given in brackets indicate number of patients concerned, ie, excluding patients not analyzed

Complications Seiler *et al*

	Total (n = 130)	Standard Whipple (n = 66)	Pylorus-preserving Whipple (n = 64)	P
Surgical morbidity				
Delayed gastric emptying*	50 (38.5)	30 (45)	20 (31)	0.096†
Bleeding	6 (4.6)	4 (6)	2 (3)	0.680‡
Fistula	3 (2.3)	1 (2)	2 (3)	0.999‡
Infection (wound or abscess)	8 (6.2)	4 (6)	4 (6)	0.999‡
Medical morbidity				
Pulmonary	17 (13.1)	10 (15)	7 (11)	0.435†
Cardiocirculatory	8 (6.2)	5 (8)	3 (5)	0.465‡
Renal	8 (6.2)	3 (5)	5 (8)	0.489‡
Other	4 (3.1)	1 (2)	3 (5)	0.361‡
Relaparotomy	3 (2.3)	1 (2)	2 (3)	0.616‡
Overall morbidity (%)	80 (61.5)	45 (68.2)	35 (54.7)	0.071†
Mortality	3 (2.3)	2 (3)	1 (2)	0.999‡

Digestive Function

- PPPD associated with less dumping, improved GI function
- Klinkenbijnl *et al* evaluated weight loss/gain after whipple
- 91 pts
- Compared PD and PPPD
- Median f/up 25 months



Digestive Function

- Takada *et al*
 - 109 pts pancreatic adenocarcinoma
 - 36 resectable
 - 24 PPPD, 22 PD
- Evaluated weight gain 1 year after surgery
- Evaluated degree of recovery at 6 months
- Weight gain:
 - PD=90.2%±5.2%
 - PPPD=103%±6.2%
- 15 PPPD vs. 3 PD felt they had complete recovery at 6 months

Conclusions

- PPPD provides adequate oncologic resection
 - No differences in survival
- Shorter operative times and less blood loss with PPPD
- No differences in post-operative complications
- No increase in DGE with PPPD
- Improved weight gain
- Possible improved quality of life