

## Supplementary Materials:

# Pancreatic Resection in Older Patients: A Retrospective Single-Center Outcome Analysis

**Dietrich A. Ruess \***, Esther A. Biesel, Christian M. Kühlbrey, Sophia Chikhladze, Julian Hipp, Jost Lünstedt, Stefan Fichtner-Feigl, Ulrich T. Hopt and Uwe A. Wittel

Center for Surgery, Department of General and Visceral Surgery, Medical Center-University of Freiburg, 79110 Freiburg, Germany; esther.biesel@uniklinik-freiburg.de (E.A.B.); c.kuehlbrey@klinikum-stuttgart.de (C.M.K.); sophia.chikhladze@uniklinik-freiburg.de (S.C.); julian.hipp@uniklinik-freiburg.de (J.H.); jost.luenstedt@uniklinik-freiburg.de (J.L.); stefan.fichtner@uniklinik-freiburg.de (S.F.-F.); ulrich.hopt@web.de (U.T.H.); uwe.wittel@uniklinik-freiburg.de (U.A.W.)

\* Correspondence: dietrich.ruess@uniklinik-freiburg.de; Tel.: +49-761-270-24010

**Table S1.** Single-institution studies.

First Author	Affiliation	Year of pub.	Age c-o	N (above c-o/total)	Entities	Procedures	Postoperative Morbidity (Elderly or Younger)	P	Postoperative Mortality (Older/Older vs. Younger)	P	Survival	P	Ref.
<b>Kairaluoma</b>	Oulu Univ., Oulu, Finland	1987	≥70	21/68	Periampullary/pancreatic cancer	PD, DP, TP, local excision	48% vs. 30%	n.a.	10% vs. 9%	n.a.	Median: 11 m vs. 11 m	NS	[29]
<b>Spencer</b>	Mayo Clinic, Rochester, USA	1990	≥70	42 (≥70 only)	PC	PD, DP, TP	Surgical: 28% Medical: 12% (slightly > younger)	n.a.	9% (slightly > younger)	n.a.	Median: 19 m 5-year: 4%	n.a.	[30]
<b>Delcore</b>	Univ. of Kansas, Kansas City, USA	1991	≥70 >80	42 (≥70 only)	PC; Ca of Ampulla, Bile duct, Duodenum, Islets	PD, TP	Major complic.: 14%	n.a.	5%	n.a.	≥70: mean 42 m; >80: mean 35 m	n.a.	[31]
<b>Hannoun</b>	Hopital St. Antoine, Paris, France	1993	≥70	44/223	Pancreatic and periampullary tumors	PD	Surgical: 36% vs. 36%	n.a.	4.5% vs. 10%	n.a.	5-year: PC:17% vs. 19%; Amp.Ca: 38% vs. 45%	n.a.	[32]
<b>Kayahara</b>	Kanazawa Univ., Kanazawa, Japan	1994	≥70	28/130	Periampullary Ca	PD	Respir.: 21% vs. 9%; other:	<0.05 NS	18% vs. 7%	NS	5-year: 23% vs. 31%	NS	[33]
<b>Fong</b>	MSKCC, New York City, USA	1995	≥70	138/488	Pancreatic malignancies	PD, DP, TP	Overall: 45%	NS	6%	NS	5-year: 21% vs. 29%	0.03	[34]
<b>DiCarlo</b>	SanRaffaele Hosp., Milan, Italy	1998	≥70	33/118	PDAC	PD, DP, TP	39% vs. 33%	NS	6% vs. 4%	NS	Median: 14 m vs. 16 m; 3-year: 0% vs. 14%	NS	[35]

<b>Sohn</b>	Johns Hopkins, Baltimore, USA	1998	≥80	46/727	PDAC, Ca of Ampulla, Bile duct, Duodenum; Cystadenoma/-Ca; CP	PD	57% vs. 41%	0.05	4.3% vs. 1.6%	NS	Periamp.Ca (n = 41): median 32 m vs. 20 m; 5-year: 19% vs. 27%	NS	[36]
<b>Al-Sharaf</b>	Univ. Hospital, Lund, Sweden	1999	≥70	27/74	PC, Ca of Ampulla, Bile duct, Duodenum; Cystadenoma; mal. Glucagonoma	PD	Overall: 45% vs 46%	NS	7% vs. 4%	NS	All: median: 318d vs. 294d; PC: median: 291d vs. 248d; PC: 5-year: 0 vs. 11%	NS	[37]
<b>Bottger</b>	Univ. Hospital, Mainz, Germany	1999	>70	300 (total)	Benign and malignant	PD, DP	PD/DP: Surgical: 30/21% vs. 22/29%; General: 28/29% vs. 16/10%	<0.001	PD/DP: 30d: 2.3/14.2% vs. 3.2/1.7%	NS	n.a.	n.a.	[38]
<b>Bathe</b>	Sylvester Cancer Center, Miami, USA	2000	≥75	16/70 (≥65)	Periampullary tumors	PD, DP	Major: 63% vs. 31%; Overall: 69% vs. 52%	0.036	25% vs. 3.7%	NS	Median 9m vs. 24 m; 5-year: 31% vs. 23%	NS	[39]
<b>Hodul</b>	Loyola Univ., Maywood, USA	2001	>70	48/122	Various, PAC most frequent	PD	60% vs. 65%	NS	0% vs. 1.4%	NS	n.a.	n.a.	[40]
<b>Bathe</b>	Univ. of Miami, Miami, USA	2001	≥65 >74	19/104 47/104	Noncystic epithelial Ca of the pancreatic head	PD, TP	Major: >74 higher; Overall: similar	0.05 NS	n.a.	n.a.	Median: 11.4 m(>74) vs. 25.1 m (65-74)	0.02	[41]
<b>Richter</b>	Univ. Mannheim-Heidelberg, Germany	2002	>70	93/519	Ca of the pancreatic head	PD, TP	Anastomotic leak: 12% vs. 5% Overall: 24% vs. 22%	0.02 NS	30d: 3% vs. 3%	NS	Median: PDAC/Amp./Bile duct Ca: 23/57/16.5 m vs. 14/46/16 m	NS	[42]

<b>Chen</b>	Taipei Vet. Gen. Hosp., Taipei, Taiwan	2003	>70 >80	82/276 16/276	Periampullary lesions	PD	Surgical: 51% (>80) vs. 56% (>70)		13% (>80) vs. 12% (>70)	NS	Median: 17.6% (>80) vs. 16% (>70)	NS	[43]
<b>Lightner</b>	UCSF, San Francisco, USA	2004	≥75	30/218	Neoplasia	PD, DP, TP	Overall: 70% vs. 56% Major cardiac event: 13% vs. 0.5%	NS <0.005	3% vs. 3%	NS	n.a.	n.a.	[44]
<b>Brozzetti</b>	Univ. of Rome, Rome, Italy	2006	≥70	57/166	PAC	PD	Overall: 49% vs. 46% Surgical: 30% vs. 29%	NS NS	10.5% vs. 3.7%; Re-OP: 83% vs. 13%	0.09 0.02	n.a.	n.a.	[45]
<b>Makary</b>	Johns Hopkins, Baltimore, USA	2006	≥80 ≥90	197/2698 10/2698	Benign and malignant	PD, TP	50% (≥90) vs. 53% (≥80) vs. 42%	<0.05	0% (≥90) vs. 4.1% (≥80) vs. 1.7%	<0.05	1-year: 60% (≥90) vs. 59% (≥80); 5-year: 0% vs. 24% vs. 43%	≤0.002	[46]
<b>Scurtu</b>	Hop. Univ. de Strasbourg, France	2006	≥70 ≥75	38/70 32/70 (≥70 only)	Cancer	PD	Overall: 50% (≥75) vs. 37% (≥70)	NS	6.2% (≥75) vs. 0% (≥70)	NS	3-year: 28% (≥75) vs. 33% (≥70)	NS	[47]
<b>Casadei</b>	Univ. di Bologna, Bologna, Italy	2006	≥70	35/88	Periampullary/ pancreatic tumors	PD, DP, TP	Overall: 40% vs. 26.4%	NS	8.6% vs. 3.8%	NS	PDAC	NS	[48]
<b>Kang</b>	Yonsei University, Seoul, Korea	2007	≥70	11/77	PAC	PD	Overall: 73% vs. 38%	0.049	0% vs. 0.02%	NS	n.a.	NS	[49]
<b>Ballarin</b>	Univ. of Modena, Modena, Italy	2009	≥75	23/98	Benign and malignant	PD, DP, TP	Overall: 83% vs. 56%	0.04	4.3% vs. 1.3%	NS	Malignancies: 3-year: 51% vs. 44%	NS	[50]
<b>Sperti</b>	Univ. of Padua, Padova, Italy	2009	≥75	52/317	Benign and malignant	PD, DP, TP, central resect.	33% vs. 31%	NS	5.7% vs. 3%	NS	PC: equal	NS	[51]
<b>Tani</b>	Wakayama Medical Univ., Wakayama, Japan	2009	≥70 ≥80	126/335 25/335	Benign and malignant	PD	Surgical Complications and Myocardial Infarction	NS	0% (≥80) vs. 1.6% (≥70) vs. 3.3%	NS	n.a.	n.a.	[52]
<b>Hardacre</b>	Case Medical Center, Miami, USA	2009	≥80	32 (≥80 only)	Benign and malignant	PD, DP, TP	66%	n.a.	0%	n.a.	Med: All: 14.4 m; Ca: 12 m; Benign: 103 m	n.a.	[53]

<b>Pratt</b>	Harvard Medical School, Boston, USA	2009	≥75	76/412	Benign and malignant	PD, DP, TP, central resect.	72% vs. 48%	<0.001	1% vs. 1%	NS	n.a.	n.a.	[54]
<b>Oliverius</b>	Inst. Clin./Exp. Med., Prague, Czech Rep.	2010	≥65	60 (≥65 only)	PC	PD, DP, TP	Overall: 28%; Serious surgical complications: 18%	n.a.	30d: 6.6%	n.a.	1-year: 63%	n.a.	[55]
<b>Khan</b>	Mayo Clinic, Rochester, USA	2010	≥80	53/617	PAC	PD	51% vs. 37%	0.004	2% vs. 1%	NS	Median: 13.5 m vs. 18.9 m	NS	[56]
<b>Lee</b>	Columbia Univ., New York City, USA	2010	≥80	74/777	Benign and malignant	PD	Overall: 47% vs. 51%; Major: 19% vs. 25%	NS NS	5.4% vs. 3.8%	NS	PDAC: Median: 11.6 m vs. 18.1 m	<0.01	[57]
<b>Ito</b>	Saiseikai Hospital, Kanagawa, Japan	2011	≥75	31/98	Benign and malignant	PD	51% vs. 46%	NS	3.2% vs. 0%	NS	3-year: 50.5% vs. 65.9%	NS	[58]
<b>Lahat</b>	Sourasky Medical, TelAviv, Israel	2011	≥70	166/460	Pancreatic neoplasm	PD, DP, TP, Enucleation	41% vs. 29%	0.01	5.4% vs. 1.4%	0.01	Median: 15 m vs. 20 m	0.05	[59]
<b>Stauffer</b>	Mayo Clinic, Jacksonville, USA	2011	≥80	32/466	Benign and malignant	PD, DP, TP	50%	n.a.	0%	n.a.	PAC: 3-year: 21%	n.a.	[60]
<b>Hatzaras</b>	Ohio State Univ., Columbus, USA	2011	≥80	27/517	Cancer	PD, DP, TP	52% vs. 59%	NS	3.7% vs. 3.7%	NS	33 m vs. 22 m	NS	[61]
<b>Barbas</b>	Duke Univ. Medical Center, Durham, USA	2012	≥65≥75	74/203 32/203	PAC	PD	69% (≥75) vs. 68% (≥65) vs. 78%	NS	9% (≥75) vs. 1% (≥65) vs. 3%	NS	Median: 23.7 m (≥75) vs. 17.8 m (≥65) vs. 21.6 m	NS	[62]
<b>Melis</b>	NYU, New York City, USA	2012	≥80	25/200	PAC	PD	68% vs. 44%	0.03	30d: 4% vs. 0.6%	NS	Median: 17.3 m vs. 13.1 m	NS	[63]
<b>Yamada</b>	Univ. of Tokushima, Japan	2012	≥75	28/84	Benign and malignant	PD	Overall: 59% vs. 57%; pulmonary: 14% vs. 2%	NS <0.05	0% vs. 0%	n.a.	No difference	NS	[64]

<b>Oliveira-Cunha</b>	St. James Univ. Hosp., Leeds, UK	2013	≥70	119/428	Benign and malignant	All	13% vs. 21%	NS	3.4% vs. 2.6%	NS	PDAC: elderly worse than younger	<0.05	[65]
<b>Belyaev</b>	Univ. of Bochum, Bochum, Germany	2013	≥80	76/1705	Benign and malignant	Non-resective and resective	Overall: 72% vs. 42% (all patients)	<0.001	11.8% vs. 2.5% (all patients)	<0.001	Ca: Median: 18 m	n.a.	[66]
<b>Oguro</b>	Ntl. Cancer Center, Tokyo, Japan	2013	≥80	22/561	Benign and malignant	PD	Major complications: 27.3% vs. 9.6%	0.008	4.5% vs. 0.9%	NS	PC: Median: 13 m vs. 29 m	NS	[67]
<b>Yamashita</b>	Kyushu Univ., Kyushu, Japan	2013	≥75	21/65	Periampullary tumors (90% malignant)	PD	Overall: 33% vs. 32%; SSI: 19% vs. 0%	NS <0.01	0% vs. 2%	NS	3-year: 42% vs. 61%	NS	[68]
<b>Adham</b>	Lyon Fac. of Medicine, Lyon, France	2014	≥70	116/344	Benign and malignant	All	Overall: 72% vs. 68%; POPF: 19% vs. 9%	NS 0.009	12.9% vs. 3.9%	0.003	All: 5-year: 41% vs. 55%; Ca: equal	0.003 ; NS	[69]
<b>Gangl</b>	Elisabethinen Hospital Linz, Austria	2014	≥80	9/108	PAC	PD/DP	Overall: 33.3% vs. 28.3%	NS	0% vs. 5.1%	NS	Median: 10.5 m vs. 12.1 m	NS	[70]
<b>Kinoshita</b>	Nara Med. Univ., Nara, Japan	2015	≥80	26 (≥80 only)	PC	PD, DP, TP	Major complications: 8%	n.a.	0%	n.a.	Median: 12.4 m	n.a.	[71]
<b>Beltrame</b>	Univ. of Padua, Padua, Italy	2015	≥80	23/385	Benign and malignant	PD	43% vs. 40%	NS	0% vs. 4%	NS	PC: Median: 19 m vs. 21 m	NS	[72]
<b>Frakes</b>	Moffitt Cancer Center, Florida, USA	2015	≥70 ≥75 ≥80	193	PC	PD		NS		NS	Median: 18.7 m vs. 16.1 m vs. 23 m vs. 23.4 m	NS	[73]
<b>Shirai</b>	Jikei Univ., Tokyo, Japan	2016	≥70≥80	97/114 17/114	Pancreatic or biliary cancer	All	n.a.	NS	0% (≥80) vs. 2% (≥70)	n.a.	n.a.	NS	[74]
<b>Renz</b>	Univ. of Munich (LMU), Germany	2016	≥75	59/300	PDAC	PD, TP	Surgical: 12% vs. 18%; non-surg.: 37% vs. 17%	NS 0.002	30d: 5% vs. 3%	NS	Median: 18.4 m vs. 19.2 m	NS	[75]
<b>Ansari</b>	Lund/Skane Univ., Lund, Sweden	2016	≥75	78/556	Benign and malignant	PD, DP, TP, Enucleation	59% vs. 65%	NS	30d: 1.3% vs. 0.8%	NS	n.a.	n.a.	[76]

<b>Di Franco</b>	University of Pisa, Pisa, Italy	2019	≥65 ≥75	345	Benign and malignant	All	Overall Surgical	<0.01 NS	n.a.	NS	Overall Cancer-related	<0.01 NS	[23]
<b>Kondo</b>	Hiroshima University, Hiroshima, Japan	2020	≥80	56/414	PDAC	All	Major complic.: 12% vs. 16%	NS	n.a.	n.a.	Resectable Borderline/unresectable	NS <0.01	[25]

c-o: cut-off; n.a.: not available or not applicable; Ca: carcinoma; PC: pancreatic cancer; PDAC: pancreatic ductal adenocarcinoma; PAC: pancreatic adenocarcinoma; CP: chronic pancreatitis; PD: pancreatoduodenectomy; DP: distal pancreatectomy; TP: total pancreatectomy; POPF: postoperative pancreatic fistula; SSI: surgical site infection; NS: not significant.

**Table S2.** Population-based/multi-institutional studies.

First author	Affiliation	Year of pub.	Age c-o	N (above c-o/total)	Population	Entities	Procedures	Postoperative Morbidity (Elderly or Elderly vs. Younger)	P	Postoperative Mortality (Elderly or Elderly vs. Younger)	P	Survival	P	Ref.
<b>Lightner</b>	UCSF, San Francisco, USA	2004	≥75	515/3113	State of California	Malignant and benign	PD, DP, TP	n.a.	n.a.	10% vs. 7%	<0.05	n.a.	n.a.	[44]
<b>Finlayson</b>	Univ. of Michigan, Ann Arbor, USA	2007	≥80 70–79 65–69	2915 13478 7125	United States (NIS + SEER)	Malignant	All	n.a.	n.a.	15.5% (≥80) vs. 9.3% (70–79) vs. 6.7% (65–69)	<0.0001	5-y.: 11% (≥80) vs. 16% (70–79) vs. 16% (65–69)	NS	[77]
<b>Riall</b>	Univ. of Texas, Galveston, USA	2008	≥80 70–79 60–69 <60	214 855 887 1780	State of Texas	Malignant and benign	All	n.a.	n.a.	11.4% (≥80) vs. 7.4% (70–79) vs. 5.8% (60–69) vs. 2.4% (<60)	<0.001	n.a.	n.a.	[78]
<b>Riall</b>	Univ. of Texas, Galveston, USA	2011	≥85 80–84 75–79 70–74 <70	61 309 655 779 589	United States (SEER)	Pancreatic cancer	All	n.a.	n.a.	11.5% (≥85) vs. 6.8% (80–84) vs. 8.1% (75–79) vs. 6.9% (70–74) vs. 7.0% (<70)	NS	2-y.: 33% (≥85) vs. 31% (80–84) vs. 33% (75–79) vs. 35% (70–74) vs. 38% (<70)	NS	[79]

<b>Dela Funente</b>	H. Lee Moffitt Cancer Center, Tampa, USA	2011	≥80	591/6293	United States (NSQIP)	Any cause	PD	Surgical and non-surgical	<0.05	6.3% vs. 2.7%	<0.05	n.a.	n.a.	[80]
<b>Turrini</b>	French Surg. Assoc., Marseille, France	2013	≥80 70–79 <70	64 288 580	37 institutions (France, Belgium, Switzerland, Monaco)	PAC	PD, DP, TP	56% vs. 63% vs. 56%	NS	4.7% vs. 2.8% vs. 3.3%	NS	Median: 30 m vs. 35.3 m vs. 24 m	NS	[81]
<b>Lee</b>	St. Luke's Roosevelt Hospital, NYC, USA	2014	≥80	475/4577	United States (NSQIP)	Malignant	PD	Surgical and non-surgical	<0.05	6% vs. 2%	0.0001	n.a.	n.a.	[82]
<b>Sho</b>	Nara Med. Univ., Nara, Japan	2016	≥80	99/1401	7 centers (Japan)	Pancreatic cancer	All	Surgical	NS	1% vs. 2%	NS	Median: 16.6 m vs. 23.2 m	0.006	[83]
<b>van der Geest</b>	IKNL, Utrecht, Netherlands	2016	≥80 75–79 70–74 <70	181 510 781 2373	Netherlands Cancer Registry	Periamp./pancreatic cancer	All	n.a.	n.a.	7.7% (≥80) vs. 7.1% (75–79) vs. 5.4% (70–74) vs. 3.6% (<70)	0.001	5-y.: 21% (≥80) vs. 17% (75–79) vs. 22% (70–74) vs. 27% (<70)	<0.001	[84]
<b>Shaib</b>	Emory University, Atlanta, USA	2019	≥76	1291/6149	United States (NIS)	Any cause	PD	n.a.	n.a.	4.11% vs. 2.77%	0.016 (OR)	n.a.	n.a.	[85]

c-o: cut-off; n.a.: not available or not applicable; PD: pancreatoduodenectomy; DP: distal pancreatectomy; TP: total pancreatectomy; PAC: pancreatic adenocarcinoma; NS: not significant; NIS: Nationwide Inpatient Sample (US); SEER: Surveillance Epidemiology and End Results database; NSQIP: National Surgical Quality Improvement Program of the American College of Surgeon.



## References

29. Kairaluoma, M.I.; Kiviniemi, H.; Ståhlberg, M. Pancreatic resection for carcinoma of the pancreas and the periampullary region in patients over 70 years of age. *Br. J. Surg.* **1987**, *74*, 116–118.
30. Spencer, M.P.; Sarr, M.G.; Nagorney, D.M. Radical pancreatectomy for pancreatic cancer in the elderly. Is it safe and justified? *Ann. Surg.* **1990**, *212*, 140–143.
31. Delcore, R.; Thomas, J.H.; Hermreck, A.S. Pancreaticoduodenectomy for malignant pancreatic and periampullary neoplasms in elderly patients. *Am. J. Surg.* **1991**, *162*, 532–535; discussion 535–536.
32. Hannoun, L.; Christophe, M.; Ribeiro, J.; Nordlinger, B.; Elriwini, M.; Turet, E.; Parc, R. A report of forty-four instances of pancreaticoduodenal resection in patients more than seventy years of age. *Surg. Gynecol. Obstet.* **1993**, *177*, 556–560.
33. Kayahara, M.; Nagakawa, T.; Ueno, K.; Ohta, T.; Takeda, T.; Miyazaki, I. Pancreatic resection for periampullary carcinoma in the elderly. *Surg. Today* **1994**, *24*, 229–233, doi:10.1007/BF02032893.
34. Fong, Y.; Blumgart, L.H.; Fortner, J.G.; Brennan, M.F. Pancreatic or liver resection for malignancy is safe and effective for the elderly. *Ann. Surg.* **1995**, *222*, 426–434; discussion 434–437.
35. DiCarlo, V.; Balzano, G.; Zerbi, A.; Villa, E. Pancreatic cancer resection in elderly patients. *Br. J. Surg.* **1998**, *85*, 607–610, doi:10.1046/j.1365-2168.1998.00685.x.
36. Sohn, T.A.; Yeo, C.J.; Cameron, J.L.; Lillemoe, K.D.; Talamini, M.A.; Hruban, R.H.; Sauter, P.K.; Coleman, J.; Ord, S.E.; Grochow, L.B.; et al. Should pancreaticoduodenectomy be performed in octogenarians? *J. Gastrointest. Surg. Off. J. Soc. Surg. Aliment. Tract* **1998**, *2*, 207–216.
37. al-Sharaf, K.; Andrén-Sandberg, A.; Ihse, I. Subtotal pancreatectomy for cancer can be safe in the elderly. *Eur. J. Surg. Acta Chir.* **1999**, *165*, 230–235, doi:10.1080/110241599750007090.
38. Bottger, T.C.; Engelmann, R.; Junginger, T. Is age a risk factor for major pancreatic surgery? An analysis of 300 resections. *Hepatogastroenterology* **1999**, *46*, 2589–2598.
39. Bathe, O.F.; Levi, D.; Caldera, H.; Franceschi, D.; Raez, L.; Patel, A.; Raub, W.A.; Benedetto, P.; Reddy, R.; Hutson, D.; et al. Radical resection of periampullary tumors in the elderly: Evaluation of long-term results. *World J. Surg.* **2000**, *24*, 353–358.
40. Hodul, P.; Tansey, J.; Golts, E.; Oh, D.; Pickleman, J.; Aranha, G.V. Age is not a contraindication to pancreaticoduodenectomy. *Am. Surg.* **2001**, *67*, 270–275; discussion 275–276.
41. Bathe, O.F.; Caldera, H.; Hamilton, K.L.; Franceschi, D.; Sleeman, D.; Livingstone, A.S.; Levi, J.U. Diminished benefit from resection of cancer of the head of the pancreas in patients of advanced age. *J. Surg. Oncol.* **2001**, *77*, 115–122.
42. Richter, A.; Niedergethmann, M.; Lorenz, D.; Sturm, J.W.; Trede, M.; Post, S. Resection for cancers of the pancreatic head in patients aged 70 years or over. *Eur. J. Surg. Acta Chir.* **2002**, *168*, 339–344, doi:10.1080/11024150260284842.
43. Chen, J.-W.; Shyr, Y.-M.; Su, C.-H.; Wu, C.-W.; Lui, W.-Y. Is pancreaticoduodenectomy justified for septuagenarians and octogenarians? *Hepatogastroenterology* **2003**, *50*, 1661–1664.
44. Lightner, A.M.; Glasgow, R.E.; Jordan, T.H.; Krassner, A.D.; Way, L.W.; Mulvihill, S.J.; Kirkwood, K.S. Pancreatic resection in the elderly. *J. Am. Coll. Surg.* **2004**, *198*, 697–706, doi:10.1016/j.jamcollsurg.2003.12.023.
45. Brozzetti, S.; Mazzoni, G.; Miccini, M.; Puma, F.; De Angelis, M.; Cassini, D.; Bettelli, E.; Tocchi, A.; Cavallaro, A. Surgical treatment of pancreatic head carcinoma in elderly patients. *Arch. Surg. (Chic. IL 1960)* **2006**, *141*, 137–142, doi:10.1001/archsurg.141.2.137.
46. Makary, M.A.; Winter, J.M.; Cameron, J.L.; Campbell, K.A.; Chang, D.; Cunningham, S.C.; Riall, T.S.; Yeo, C.J. Pancreaticoduodenectomy in the very elderly. *J. Gastrointest. Surg. Off. J. Soc. Surg. Aliment. Tract* **2006**, *10*, 347–356, doi:10.1016/j.gassur.2005.12.014.
47. Scurtu, R.; Bachellier, P.; Oussoultzoglou, E.; Rosso, E.; Maroni, R.; Jaeck, D. Outcome after pancreaticoduodenectomy for cancer in elderly patients. *J. Gastrointest. Surg. Off. J. Soc. Surg. Aliment. Tract* **2006**, *10*, 813–822, doi:10.1016/j.gassur.2005.12.010.
48. Casadei, R.; Zanini, N.; Morselli-Labate, A.M.; Calculli, L.; Pezzilli, R.; Potì, O.; Grottola, T.; Ricci, C.; Minni, F. Prognostic factors in periampullary and pancreatic tumor resection in elderly patients. *World J. Surg.* **2006**, *30*, 1992–2001; discussion 2002–2003, doi:10.1007/s00268-006-0122-5.

49. Kang, C.M.; Kim, J.Y.; Choi, G.H.; Kim, K.S.; Choi, J.S.; Lee, W.J.; Kim, B.R. Pancreaticoduodenectomy of Pancreatic Ductal Adenocarcinoma in the Elderly. *Yonsei Med. J.* **2007**, *48*, 488–494, doi:10.3349/ymj.2007.48.3.488.
50. Ballarin, R.; Spaggiari, M.; Benedetto, F.D.; Montalti, R.; Masetti, M.; Ruvo, N.D.; Romano, A.; Guerrini, G.P.; Blasiis, M.G.D.; Gerunda, G.E. Do not Deny Pancreatic Resection to Elderly Patients. *J. Gastrointest. Surg.* **2008**, *13*, 341–348, doi:10.1007/s11605-008-0601-0.
51. Sperti, C.; Gruppo, M.; Beltrame, V.; Militello, C.; Berselli, M.; Frison, L.; Morbin, T.; Longo, C.; Caruso, V.; Pedrazzoli, S. Outcome of pancreatic resection in elderly patients. *BMC Geriatr.* **2009**, *9*, 1–2, doi:10.1186/1471-2318-9-S1-A22.
52. Tani, M.; Kawai, M.; Hirono, S.; Ina, S.; Miyazawa, M.; Nishioka, R.; Shimizu, A.; Uchiyama, K.; Yamaue, H. A pancreaticoduodenectomy is acceptable for periampullary tumors in the elderly, even in patients over 80 years of age. *J. Hepatobiliary Pancreat. Surg.* **2009**, *16*, 675–680, doi:10.1007/s00534-009-0106-6.
53. Hardacre, J.M.; Simo, K.; McGee, M.F.; Stellato, T.A.; Schulak, J.A. Pancreatic resection in octogenarians. *J. Surg. Res.* **2009**, *156*, 129–132, doi:10.1016/j.jss.2009.03.047.
54. Pratt, W.B.; Gangavati, A.; Agarwal, K.; Schreiber, R.; Lipsitz, L.A.; Callery, M.P.; Vollmer, C.M. Establishing standards of quality for elderly patients undergoing pancreatic resection. *Arch. Surg. (Chic. IL 1960)* **2009**, *144*, 950–956, doi:10.1001/archsurg.2009.107.
55. Oliverius, M.; Kala, Z.; Varga, M.; Gürlich, R.; Lanska, V.; Kubsova, H. Radical surgery for pancreatic malignancy in the elderly. *Pancreatol. Off. J. Int. Assoc. Pancreatol. IAP AI* **2010**, *10*, 499–502, doi:10.1159/000288705.
56. Khan, S.; Sclabas, G.; Lombardo, K.R.; Sarr, M.G.; Nagorney, D.; Kendrick, M.L.; Donohue, J.H.; Que, F.G.; Farnell, M.B. Pancreatoduodenectomy for ductal adenocarcinoma in the very elderly; is it safe and justified? *J. Gastrointest. Surg. Off. J. Soc. Surg. Aliment. Tract* **2010**, *14*, 1826–1831, doi:10.1007/s11605-010-1294-8.
57. Lee, M.K.; Dinorcio, J.; Reavey, P.L.; Holden, M.M.; Genkinger, J.M.; Lee, J.A.; Schrope, B.A.; Chabot, J.A.; Allendorf, J.D. Pancreaticoduodenectomy can be performed safely in patients aged 80 years and older. *J. Gastrointest. Surg. Off. J. Soc. Surg. Aliment. Tract* **2010**, *14*, 1838–1846, doi:10.1007/s11605-010-1345-1.
58. Ito, Y.; Kenmochi, T.; Irino, T.; Egawa, T.; Hayashi, S.; Nagashima, A.; Kitagawa, Y. The impact of surgical outcome after pancreaticoduodenectomy in elderly patients. *World J. Surg. Oncol.* **2011**, *9*, 102, doi:10.1186/1477-7819-9-102.
59. Lahat, G.; Sever, R.; Lubezky, N.; Nachmany, I.; Gerstenhaber, F.; Ben-Haim, M.; Nakache, R.; Koriansky, J.; Klausner, J.M. Pancreatic cancer: Surgery is a feasible therapeutic option for elderly patients. *World J. Surg. Oncol.* **2011**, *9*, 10, doi:10.1186/1477-7819-9-10.
60. Stauffer, J.A.; Grewal, M.S.; Martin, J. k.; Nguyen, J.H.; Asbun, H.J. Pancreas Surgery Is Safe for Octogenarians. *J. Am. Geriatr. Soc.* **2011**, *59*, 184–186, doi:10.1111/j.1532-5415.2010.03223.x.
61. Hatzaras, I.; Schmidt, C.; Klemanski, D.; Muscarella, P.; Melvin, W.S.; Ellison, E.C.; Bloomston, M. Pancreatic resection in the octogenarian: A safe option for pancreatic malignancy. *J. Am. Coll. Surg.* **2011**, *212*, 373–377, doi:10.1016/j.jamcollsurg.2010.10.015.
62. Barbas, A.S.; Turley, R.S.; Ceppa, E.P.; Reddy, S.K.; Blazer, D.G.; Clary, B.M.; Pappas, T.N.; Tyler, D.S.; White, R.R.; Lagoo, S.A. Comparison of outcomes and the use of multimodality therapy in young and elderly people undergoing surgical resection of pancreatic cancer. *J. Am. Geriatr. Soc.* **2012**, *60*, 344–350, doi:10.1111/j.1532-5415.2011.03785.x.
63. Melis, M.; Marcon, F.; Masi, A.; Pinna, A.; Sarpel, U.; Miller, G.; Moore, H.; Cohen, S.; Berman, R.; Pachter, H.L.; et al. The safety of a pancreaticoduodenectomy in patients older than 80 years: Risk vs. benefits. *HPB* **2012**, *14*, 583–588, doi:10.1111/j.1477-2574.2012.00484.x.
64. Yamada, S.; Shimada, M.; Utsunomiya, T.; Morine, Y.; Imura, S.; Ikemoto, T.; Mori, H.; Kanamoto, M.; Hanaoka, J.; Iwahashi, S.; et al. Surgical results of pancreatoduodenectomy in elderly patients. *Surg. Today* **2012**, *42*, 857–862, doi:10.1007/s00595-012-0169-x.
65. Oliveira-Cunha, M.; Malde, D.J.; Aldouri, A.; Morris-Stiff, G.; Menon, K.V.; Smith, A.M. Results of pancreatic surgery in the elderly: Is age a barrier? *HPB* **2013**, *15*, 24–30, doi:10.1111/j.1477-2574.2012.00549.x.
66. Belyaev, O.; Herzog, T.; Kaya, G.; Chromik, A.M.; Meurer, K.; Uhl, W.; Müller, C.A. Pancreatic Surgery in the Very Old: Face to Face With a Challenge of the Near Future. *World J. Surg.* **2013**, *37*, 1013–1020, doi:10.1007/s00268-013-1944-6.

67. Oguro, S.; Shimada, K.; Kishi, Y.; Nara, S.; Esaki, M.; Kosuge, T. Perioperative and long-term outcomes after pancreaticoduodenectomy in elderly patients 80 years of age and older. *Langenbecks Arch. Surg. Dtsch. Ges. Für Chir.* **2013**, *398*, 531–538, doi:10.1007/s00423-013-1072-7.
68. Yamashita, Y.-I.; Shirabe, K.; Tsujita, E.; Takeishi, K.; Ikeda, T.; Yoshizumi, T.; Furukawa, Y.; Ishida, T.; Maehara, Y. Surgical outcomes of pancreaticoduodenectomy for periampullary tumors in elderly patients. *Langenbecks Arch. Surg. Dtsch. Ges. Für Chir.* **2013**, *398*, 539–545, doi:10.1007/s00423-013-1061-x.
69. Adham, M.; Bredt, L.C.; Robert, M.; Perinel, J.; Lombard-Bohas, C.; Ponchon, T.; Valette, P.J. Pancreatic resection in elderly patients: Should it be denied? *Langenbecks Arch. Surg. Dtsch. Ges. Für Chir.* **2014**, *399*, 449–459, doi:10.1007/s00423-014-1183-9.
70. Gangl, O.; Fröschl, U.; Függer, R. Surgical quality data and survival after pancreatic cancer resections: A comparison of results for octogenarians and younger patients. *Wien. Klin. Wochenschr.* **2014**, *126*, 757–761, doi:10.1007/s00508-014-0603-8.
71. Kinoshita, S.; Sho, M.; Yanagimoto, H.; Satoi, S.; Akahori, T.; Nagai, M.; Nishiwada, S.; Yamamoto, T.; Hirooka, S.; Yamaki, S.; et al. Potential role of surgical resection for pancreatic cancer in the very elderly. *Pancreatol. Off. J. Int. Assoc. Pancreatol. IAP AI* **2015**, *15*, 240–246, doi:10.1016/j.pan.2015.03.015.
72. Beltrame, V.; Gruppo, M.; Pastorelli, D.; Pedrazzoli, S.; Merigliano, S.; Sperti, C. Outcome of pancreaticoduodenectomy in octogenarians: Single institution's experience and review of the literature. *J. Visc. Surg.* **2015**, *152*, 279–284, doi:10.1016/j.jviscsurg.2015.06.004.
73. Frakes, J.M.; Strom, T.; Springett, G.M.; Hoffe, S.E.; Balducci, L.; Hodul, P.; Malafa, M.P.; Shridhar, R. Resected pancreatic cancer outcomes in the elderly. *J. Geriatr. Oncol.* **2015**, *6*, 127–132, doi:10.1016/j.jgo.2014.11.005.
74. Shirai, Y.; Shiba, H.; Horiuchi, T.; Saito, N.; Furukawa, K.; Sakamoto, T.; Gocho, T.; Ishida, Y.; Yanaga, K. Assessment of Surgical Outcome After Pancreatic Resection in Extremely Elderly Patients. *Anticancer Res.* **2016**, *36*, 2011–2017.
75. Renz, B.W.; Khalil, P.N.; Mikhailov, M.; Graf, S.; Schiergens, T.S.; Niess, H.; Boeck, S.; Heinemann, V.; Hartwig, W.; Werner, J.; et al. Pancreaticoduodenectomy for adenocarcinoma of the pancreatic head is justified in elderly patients: A Retrospective Cohort Study. *Int. J. Surg.* **2016**, *28*, 118–125, doi:10.1016/j.ijssu.2016.02.064.
76. Ansari, D.; Aronsson, L.; Fredriksson, J.; Andersson, B.; Andersson, R. Safety of pancreatic resection in the elderly: A retrospective analysis of 556 patients. *Ann. Gastroenterol. Q. Publ. Hell. Soc. Gastroenterol.* **2016**, *29*, 221–225, doi:10.20524/aog.2016.0016.
77. Finlayson, E.; Fan, Z.; Birkmeyer, J.D. Outcomes in octogenarians undergoing high-risk cancer operation: A national study. *J. Am. Coll. Surg.* **2007**, *205*, 729–734, doi:10.1016/j.jamcollsurg.2007.06.307.
78. Riall, T.S.; Reddy, D.M.; Nealon, W.H.; Goodwin, J.S. The effect of age on short-term outcomes after pancreatic resection: A population-based study. *Ann. Surg.* **2008**, *248*, 459–467, doi:10.1097/SLA.0b013e318185e1b3.
79. Riall, T.S.; Sheffield, K.M.; Kuo, Y.-F.; Townsend, C.M.; Goodwin, J.S. Resection benefits older adults with locoregional pancreatic cancer despite greater short-term morbidity and mortality. *J. Am. Geriatr. Soc.* **2011**, *59*, 647–654, doi:10.1111/j.1532-5415.2011.03353.x.
80. de la Fuente, S.G.; Bennett, K.M.; Pappas, T.N.; Scarborough, J.E. Pre- and intraoperative variables affecting early outcomes in elderly patients undergoing pancreaticoduodenectomy. *HPB* **2011**, *13*, 887–892, doi:10.1111/j.1477-2574.2011.00390.x.
81. Turrini, O.; Paye, F.; Bachellier, P.; Sauvanet, A.; Sa Cunha, A.; Le Treut, Y.P.; Adham, M.; Mabrut, J.Y.; Chiche, L.; Delpero, J.R. Pancreatectomy for adenocarcinoma in elderly patients: Postoperative outcomes and long term results: A study of the French Surgical Association. *Eur. J. Surg. Oncol. EJSO* **2013**, *39*, 171–178, doi:10.1016/j.ejso.2012.08.017.
82. Lee, D.Y.; Schwartz, J.A.; Wexelman, B.; Kirchoff, D.; Yang, K.C.; Attiyeh, F. Outcomes of pancreaticoduodenectomy for pancreatic malignancy in octogenarians: An American College of Surgeons National Surgical Quality Improvement Program analysis. *Am. J. Surg.* **2014**, *207*, 540–548, doi:10.1016/j.amjsurg.2013.07.042.
83. Sho, M.; Murakami, Y.; Kawai, M.; Motoi, F.; Satoi, S.; Matsumoto, I.; Honda, G.; Uemura, K.; Yanagimoto, H.; Kurata, M.; et al. Prognosis after surgical treatment for pancreatic cancer in patients aged 80 years or older: A multicenter study. *J. Hepato-Biliary-Pancreat. Sci.* **2016**, *23*, 188–197, doi:10.1002/jhbp.320.

84. Geest, L.G.M. van der; Besselink, M.G.H.; Gestel, Y.R.B.M. van; Busch, O.R.C.; Hingh, I.H.J.T. de; Jong, K.P. de; Molenaar, I.Q.; Lemmens, V.E.P.P. Pancreatic cancer surgery in elderly patients: Balancing between short-term harm and long-term benefit. A population-based study in the Netherlands. *Acta Oncol.* **2016**, *55*, 278–285, doi:10.3109/0284186X.2015.1105381.
85. Shaib, W.L.; Zakka, K.; Hoodbhoy, F.N.; Belalcazar, A.; Kim, S.; Cardona, K.; Russell, M.C.; Maithel, S.K.; Sarmiento, J.M.; Wu, C.; et al. In-hospital 30-day mortality for older patients with pancreatic cancer undergoing pancreaticoduodenectomy. *J. Geriatr. Oncol.* **2020**, *11*, 660–667, doi:10.1016/j.jgo.2019.10.012.