SHORT COMMUNICATION

Multivisceral Resection For Pancreatic Head Cancer: Is It Worthwhile?

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Pancreatic cancer has a dismal prognosis [1, 2]. Surgical resection with negative margins is the best treatment option and the only curative one, but it obtains a 5-year survival rate of only 15-25% [1, 2, 3]. When the tumor is located in the pancreatic head, pancreaticoduodenectomy (PD) is performed. This surgical technique includes the resection of several organs (pancreatic head, duodenum, bile duct, gallbladder and distal stomach) [1, 4]. At specialized centers, PD presents a postoperative mortality rate of 5% and a morbidity rate of around 50% [1, 2, 4].

At the time of diagnosis, more than 40% of pancreatic tumors present locally advanced disease with infiltration of adjacent organs and/or vascular structures [1, 3]. The resection of other organs not included in the PD, which is necessary to perform an oncologically correct surgery (R0), is usually called PD with Multivisceral resection (PD-MVR). PD-MVR is considered to have a higher postoperative risk than PD alone [1, 2, 3, 4, 5, 6].

Few studies of PD-MVR have been published. Those that are available are heterogeneous, because they include different types of surgery (PD, distal pancreatectomy and total pancreatectomy), with or without portal or arterial resection [1, 3, 4, 5], and different indications for different pathologies. Examples are hepatopancreatoduodenectomies performed in Asia for the treatment of cholangiocarcinoma [5, 7], right hemicolectomy plus PD in patients with colon cancer located in the hepatic flexure invading duodenum and pancreas [8], PD-MVR due to rare pancreatic tumors (neuroendocrine tumors, sarcomas, metastases, and so on) and finally PD-MVR for pancreatic cancer, which is the subject of this Editorial.

PD-MVR for pancreatic cancer is a controversial procedure [6]. The invasion of neighboring organs is considered by some authors a contraindication for PD due to the aggressiveness of the surgery, the possible postoperative complications, poor oncological benefit obtained and short survival (3,4). However, other authors argue that when the tumor invades neighboring organs, PD-MVR is the only valid oncological surgical resection [4]. Kulemann et al obtained a higher rate of R0 in the PD-MVR group than in conventional PD, but curiously the survival of the PD-MVR group was worse [1].

The organs most often resected in PD-MVR are right colon and liver. When colon resection is performed, it may be due to direct invasion or vascular involvement of mesocolon [4]. The anastomotic dehiscence rate is variable (0 to 16%) and there is also a high percentage of postoperative intestinal obstruction [3, 4, 5]. The liver may be affected by direct invasion or by liver metastases, treated usually by minor hepatectomies. In Hartwig et al's series, liver resection had a lower complication rate than resections of other organs [2]. Other organs removed in the PD-MVR are: kidney, adrenal gland, entire stomach, diaphragm, small intestine, and combined resections of various organs [1, 2, 3, 4, 5, 6].

Data from previously published studies of PD-MVR are shown in **Table 1**. The percentage of PD-MVR over the total number of reviewed cases ranges between 2.75-18%, the diagnosis of pancreatic cancer from 36-75%, the percentage of males between 47-64.4%, and the average age between 62 and 67 years [1, 2, 3, 4, 5, 6]. Except in one series, the most frequently resected organ was the colon; the most frequently performed surgery was PD, and some papers included vascular resections. The morbidity rate of the PD-MVR ranges between 50 and 69%, and mortality between 0 and 10%; survival is between 12 and 20 months [1, 2, 3, 4, 5, 6].

In the studies which have compared patients with PD and PD-MVR, the PD-MVR group presents the following characteristics **(Table 2)**:

- Preoperative: diagnosis of pancreatic cancer may be higher or lower depending on the series [4, 5, 6]; more preoperative diabetes mellitus [4], higher percentage of men, older patients and more ASA III cases [6].

- Intraoperative: longer operating time [1, 2, 4, 5, 6], less PD with pyloric preservation [5], more total pancreatectomies [1], more venous resections [1, 4], more perioperative blood loss and greater intraoperative transfusion [2, 3, 4].

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Table 1. Series of PD-MVR.

Ref	PD	PD MVR	M/F	Age	Indication	Surgery	Organ	Postop. Complications	Survival
Suzuki 2004	104	12 (11.5%)	8/4	66.7	Pancreas cancer: 9 (75%) Other cancer: 3	4 TP 8 PD	Right colon:12	50% Morbidity 0% Mortality	14 Months (median)
Nifkarjam 2009	105	19 (18%)	8 (47%)/11	67	Pancreas Cancer: 7 (36%) GIST/Sarcoma: 4 Metastasis: 3 NET: 1 IPMT: 1	19 PD	Right colon: 12 Right kidney: 2 Liver: 2 Right colon + right kidney: 3 Small bowel: 1 Adrenal: 1	Morbidity 68% Readmission 34%	NA
Hartwig 2009	NA	101	65(64.4%)/36	63	Páncreas cancer: 67 (66%) NET: 10 IPMT:7 Other: 17	DP:60 PD: 21 TP: 20	247 Organs: Colon: 37% Stomach: 33.7% Adrenal: 27.7% Liver: 18.8% Artery: 16.8% Kidney: 11.9% Small bowel: 6.9%	Morbidity 55.5% Mortality 3%	19.8 Months
Burdelski 2011	512	55 (10.7%)	NA	NA	NA	30 PD 14 STP 11 TP	Stomach: 32 Liver: 24 Colon: 22 Kidney 17 Diapraghm: 11 Small bowel: 5	Morbidity 69% Mortality 7%	16 Months
Bhayani 2014	9927	273 (2.75%)	161 59%)/112	63	Pancreas cancer: 155 (56.8%) Benign; 53 Duodenal cancer: 32 Perimpullary cancer: 12	--	Colon: 157 Small bowel: 83 Stomach: 34 Kidney: 13 Adrenal: 12 Liver: 7	Morbidity 65.2% Mortality 8.8%	NA
Kulemann 2015	359	20 (5.5%)	NA	62	NA	13 PD 7TP	Colon: 7 Stomach: 6 Liver: 5 Small bowel: 1 Adrenal gland: 1 Portal vein: 12	Morbidity 65% Mortality 10% Relaparatomies:15%	12 months

DP: distal pancretectomy; F female; IPMT intraductal papillary mucinous tumor; M male; NET neuroendocrine tumor; PD pancreatoduodenectomy; PD-MVR PD plus multivisceral resection; TP total pancreatectomy; STP subtotal pancreatectomy

Table 2. Characteristics of PD-MVR Group Comparing With PD Group.

Series	Preoperative	Intraoperative	Postoperative	Stage
Suzuki 2004	PC More Frequent More Preoperative DM	Higher Operative Time More Blood Loss (NS) More Venous Resection	-	More Stage IVB
Nifkarjam 2009	PC Less Frequent	Higher Operative Time Less PPPD	More Postoperative Bleeding – Higher ICU Stay	
Hartwig 2009	-	Higher Operative Time More Blood Loss + More Blood Tranfusion	Higher Relaparotomies Index Higher UCI Stay Higher Postoperative Complications Longer Hospital Stay	
Burdelski 2011	-	More Intraoperative Transfusion	Higher Relaparotomies Index Higher ICU Stay Higher Postoperative Complications	Worst TNM Less R0
Bhayani 2014	- More ASAIII More Male Older Patients More Duodenal Cancer Less Periampullary Cancer	Higher Operative Time	More Postoperative Bleeding Higher Morbidity Higher Mortality Longer Hospital Stay	
Kulemann 2015	-	Higher Operative Time More Total Pancreatectomies More Venous Resection	Higher Mortality (NS) -	More R0 Negative Prognostic Factor In Multivariate Analysis Worst Overall Survival (NS)

- Postoperative: longer ICU stay [2, 3, 5], more major complications [2, 3, 6], more relaparotomies (2.3), more episodes of postoperative bleeding (5.6), higher mortality (6) and longer hospital stay (2.6).

- Stage: worse TNM [3], less R0 [3] and more R0 [1], more patients with stage IVb [4].

In a univariate analysis of morbidity in a PD-MVR group carried out by Burdelski et al., intraoperative transfusion, colon resection, kidney and liver resection were predictors of morbidity [3]. In the multivariate analysis, only transfusion and kidney resection remained as predictors of morbidity. In the survival study, univariate analysis found that tumor stage, kidney resection, resection of four or more organs in addition to PD and postoperative transfusion had a predictive value for survival. In the multivariate analysis, only tumor stage remained as a predictor of survival [3]. Resection of two or more organs has been associated with an increased need for relaparotomy [2].

In conclusion, the few series of PD-MVR published to date are very heterogeneous. PD-MVR has higher morbidity and mortality rates than PD, but obtains similar oncologic results. The lack of results of RCTs means that PD-MVR cannot be systematically recommended, but neither are there solid grounds for ruling out its use.

Conflict-of-interest

The authors have no conflict of interest to declare.

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