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Evaluation of a predictive model for pancreatic fistula based on amylase value in drains after pancreatic resection

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Abstract

BACKGROUND: Amylase value in drains (AVD) is a predictor of pancreatic fistula (PF). We evaluated the accuracy of an AVD-based model.

METHODS: Two hundred thirty-one patients underwent pancreatoduodenectomy with pancreaticojejunostomy (PDPJ) or pancreatoduodenectomy with duct-to-mucosa (PDDTM) and distal pancreatectomy (DP). Patients with AVD greater than 5,000 U/L on postoperative day (POD) 1 underwent AVD measurement on POD5.

RESULTS: Sensitivity and specificity of POD1 AVD greater than 5,000 in predicting PF were 71% and 90%, respectively. The sensitivity and specificity of POD5 AVD greater than 200 were 90% and 83%, respectively. AVD greater than 1,000 (for PDPJ) and 2,000 U/L (PDDTM and DP) represented the most accurate cutoffs on POD1. AVD greater than 200 (PDPJ), 300 (PDDTM), and 50 U/L (DP) represented the cutoffs with the highest sensitivity in predicting PF on POD5.

CONCLUSION: AVD-based model for predicting PF after pancreatic resection is an accurate tool, although AVD cutoffs should be evaluated for each type of operation.

Pancreatic fistula (PF) is the most common and challenging complication after pancreatectomy.[1–3] The presence of a PF is associated with a higher mortality risk, a longer length of hospital stay, increased costs, delayed administration of adjuvant treatments, and poorer quality of life.[4–6] Different predictors of PF have been proposed.[7–12] Although a correct prognostication of a PF cannot prevent the occurrence of this complication, the postoperative prediction of PF can influence the management of abdominal drains preventing an early or late removal. In 2005, Molinari et al[13] conducted a prospective study that demonstrated the accuracy of a predictive model based on amylase value in drain (AVD) measured on postoperative day (POD) 1 and POD5. On the basis of their results, the same group published a randomized clinical trial that showed the benefit in terms of complications in the group of patients with an early drain removal after pancreatic resection.[14] The AVD predictive model was the only criterion for the management of abdominal drains. Nevertheless, this model was estimated on the

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basis of a large cohort that included both distal pancreatectomy (DP) and pancreatoduodenectomy (PD). Moreover, the external validity of the AVD predictive model has not been demonstrated so far. The aim of this study was to validate the accuracy of the AVD-based model in predicting PF in a cohort of consecutive patients who underwent pancreatic resection.

Methods

Study population

Between January 2011 and May 2012, 231 consecutive patients underwent PD or DP. For all patients, demographics, pathologic examinations, operative details, and postoperative outcomes were retrospectively collected and analyzed. Histology revealed a ductal adenocarcinoma in 116 patients (50%), a neuroendocrine neoplasm in 30 patients (13%), and a cystic tumor in 35 (15%) patients. In 27 patients (12%), pancreatic resection was performed for other reasons (chronic pancreatitis, metastatic lesions, or other uncommon tumors).

Surgical procedure

For PD, a pylorus-preserving procedure was always performed. Reconstruction of the pancreatic remnant included both PD with pancreaticojejunostomy (PDPJ) and PD with duct-to-mucosa (PDDTM) anastomosis. Each surgeon was free to choose the type of pancreatic anastomosis, although PJ has been the preferred reconstruction in the first months of the study. PJ was performed with a single-layer interrupted suture using nonabsorbable stiches between the pancreatic capsule and jejunal seromuscular layer. DTM was performed using 8 interrupted 4.0 or 5.0 polydioxanone (PDS-II; Johnson and Johnson Co., New Brunswick, NJ, USA) between the pancreatic duct and jejunal mucosa. Two "easy flow" drains were routinely placed (12 mm; Chimed R Livorno, Livorno, Italy) adjacent to the anastomosis. The right-sided drain was placed posterior to the hepaticojejunostomy and anterior to the PJ. The left drain passed posterior to the PJ and anterior to the hepaticojejunostomy. DP always included en bloc splenectomy and the pancreatic stump was always sutured with interrupted nonabsorbable stitches. The main pancreatic duct (MPD), when identified, was routinely sutured with a single nonabsorbable stitch. One "easy flow" drain was routinely placed (12 mm; Chimed R Livorno) near the pancreatic stump. Another drain was routinely placed above the superior pancreatic margin.

Perioperative management

Postoperative management of patients did not include a specific protocol. Prophylactic octreotide was administered to prevent PF only in those patients who underwent PD. The pancreatic texture was defined as "soft" or "firm" by the evaluation of the operating surgeon. The MPD diameter was measured by the pathologist on final histologic examination. In all patients, AVD was measured in both drains on POD1. AVD was also measured on POD5 for those patients who maintained at least one drain. Drains were usually removed by the operating surgeon on the basis of POD1 AVD and/or POD5 AVD. Nevertheless, as drain management protocol was not standardized, some surgeons applied the protocol proposed by Molinari et al,[13] whereas some others evaluated also the quality of fluids as well as intraoperative findings (ie, pancreatic texture, MPD diameter, bleeding, risk of biliary fistula). In all the cases, drains were not removed in the presence of fresh blood, biliary and/or enteric liquid. Drains were always left in place until POD5 if POD1 AVD greater than 5,000 U/L. PF was defined according to the International Study Group of Pancreatic Fistula as any measurable volume of fluid on or after POD3 with amylase content greater than 3 times the serum amylase activity.[15] PF was then classified as grade A, B, or C as defined by the International Study Group of Pancreatic Fistula guidelines.[15]

Statistical analysis

Distribution of continuous variables is reported as median and interquartile range (IQR) (25th and 75th percentiles). Categorical variables are presented as numbers and percentages. The comparison between subgroups was carried out using Student t test or Mann–Whitney U test for continuous variables. Qualitative data were compared using the chi-square test or Fisher's exact test when necessary. Study of potential prognostic factors for PF was carried out using logistic analysis. Logistic regression was performed for multivariate models with P values and 95% confidence intervals estimated by the Wald method. The predictive power of POD1 AVD and POD5 AVD was assessed by calculating the area under the receiver–operator characteristic (ROC) curve. All tests were 2-sided. Statistical analyses were performed using SPSS 16.0 (SPSS, Inc, Chicago, IL). P values were considered significant when less than or equal than .05.

Results

Clinical and operative characteristics

The main demographics, clinical and operative characteristics are listed in Table 1. The overall rate of PF was 36% ($n = 83$). The frequencies of PF for DP, PDPJ and PDDTM were 59%, 35% and 16%, respectively ($P = .007$). The univariate and multivariate analyses of PF predictors are summarized in Table 2. On multivariate analysis, independent predictors of PF were the type of operation (DP [odds ratio, OR 5.395], $P = .025$ and PDPJ [OR