

ORIGINAL ARTICLE

Defining the practice of pancreatoduodenectomy around the world

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Abstract

Background: Pancreatoduodenectomy (PD) is a technically challenging operation characterized by numerous management decisions.

Objective: This study was designed to test the hypothesis that there is significant variation in the contemporary global practice of PD.

Methods: A survey with native-language translation was distributed to members of 22 international gastrointestinal surgical societies. Practice patterns and surgical decision making for PD were assessed. Regions were categorized as North America, South/Central America, Asia/Australia, and Europe/Africa/Middle East.

Results: Surveys were completed by 897 surgeons, representing six continents and eight languages. The median age and length of experience of respondents were 45 years and 13 years, respectively. In 2013, surgeons performed a median of 12 PDs and reported a median career total of 80 PDs; only 53.8% of respondents had surpassed the number of PDs considered necessary to surmount the learning curve (>60). Significant regional differences were observed in annual and career PD volumes ($P < 0.001$). Only 3.7% of respondents practised pancreas surgery exclusively, but 54.8% performed only hepatopancreatobiliary surgery. Worldwide, the preferred form of anastomotic reconstruction was pancreatojejunostomy (88.7%). Regional variability was evident in terms of anastomotic/suture technique, stent use and drain use (including type and number), as well as in the use of octreotide, sealants and autologous patches ($P < 0.02$ for all).

Conclusions: Globally, there is significant variability in the practice of PD. Many of these choices contrast with established randomized evidence and may contribute to variance in outcomes.

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Introduction

Pancreatoduodenectomy (PD) is a technically challenging operation characterized by numerous management decisions. Operative options refer to the type of anastomotic reconstruction, as well as the use of trans-anastomotic stents, biological sealants, autologous tissue patches and drains. Additionally, surgeons are confronted with management choices concerning the administration of prophylactic somatostatin analogues and the duration of drainage. Many of these practices have been scrutinized in randomized controlled trials (RCTs), which have

established Level I evidence in the contemporary surgical literature.^{1–6}

The International Study Group on Pancreatic Surgery (ISGPS) has served as the foundation for many of these investigations. Through a rigorous consensus process, the ISGPS established standardized definitions for many post-pancreatectomy complications.^{7–9} In addition to improving the quality of comparative research, these definitions have facilitated unbiased comparisons of intraoperative techniques and management decisions.

This study explores the hypothesis that there is significant variation in the contemporary global practice of PD. The primary aims of this study are two-fold. The first is to establish global benchmarks for the surgical experience of surgeons who

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practise PD; results will be compared with published cut-offs relating to the PD learning curve and high-volume status. The second aim is to report current worldwide practice patterns in surgeons who perform PD. Collective responses will be compared with best clinical practice established by contemporary Level I evidence. Trends will be assessed to determine if there is regional bias in the implementation of best clinical practices.

Materials and methods

This study was approved by the institutional review board (IRB) at the Hospital of the University of Pennsylvania. A structured, web-based survey was designed and administered to surgeons who perform pancreatic surgery through 22 international gastrointestinal surgical societies. First, support was engendered from several of the larger international gastrointestinal surgical societies, including the International Hepato-Pancreato-Biliary Association (IHPBA), the Society for Surgery of the Alimentary Tract (SSAT) and the Pancreas Club. These organizations distributed the survey to their extensive global memberships. Next, major regional associations [the Americas Hepato-Pancreato-Biliary Association (AHPBA), the Asian-Pacific Hepato-Pancreato-Biliary Association (A-HPBA), the European/African/Middle Eastern Hepato-Pancreato-Biliary Association (E-AHPBA)] were targeted, as were many of the national chapters under their respective purviews. To facilitate global catchment, the e-surveys were made available in eight different languages, including English, Chinese (i.e. Mandarin), French, German, Italian, Japanese, Portuguese and Spanish. Although the precise number of surgeons to whom the survey was offered was not evident (some memberships overlapped across the various participating organizations), it is estimated that this totalled 1500–2000 surgeons globally.

Surgeons initially indicated their region of practice. Geographical boundaries were established *a priori* as follows: North America; South and Central America; Asia and Australia, and Europe, Africa and the Middle East. Next, respondents were asked to report any relevant fellowship training, as well as other experience-related parameters, such as age, annual and career volumes, and years of experience as an attending or staff surgeon. The scope of the respondent's current clinical practice was also characterized.

Questions regarding the practice patterns of individual surgeons were presented using a modified Likert scale: (i) never, 0%; (ii) occasionally, 1–25%; (iii) sometimes, 26–75%; (iv) frequently, 76–99%, and (v) always, 100%. Specific operative techniques evaluated were pancreatogastrostomy (PG), dunking/invagination, isolated Roux limb, duct occlusion, anastomotic suturing preferences, trans-anastomotic stents, autologous tissue patches, biological sealants (e.g. Tisseel, fibrin glue), and placement of externalized drains. Management decisions referred to the administration of prophylactic

somatostatin analogues (e.g. octreotide), and whether the surgeons practise early drain removal [postoperative day (PoD) ≤ 3] based upon drain amylase values.

Statistical analysis

Descriptive statistics are presented as frequencies for categorical variables, and as the mean \pm standard deviation (SD) and median [interquartile range (IQR)] for continuous variables. Pearson's chi-squared test or Fisher's exact test, and independent Student's *t*-tests or analysis of variance (ANOVA) testing were used to analyse categorical and continuous variables, respectively. Non-parametric comparisons of continuous variables were assessed by Wilcoxon rank sum tests or Kruskal–Wallis one-way ANOVA. *P*-values of ≤ 0.05 were considered to indicate statistical significance. All tests were two-sided. Statistical computations were performed utilizing IBM SPSS Statistics for Windows Version 22.0 (IBM Corp., Armonk, NY, USA).

Results

Demographics and surgical experience

Surveys were completed by 897 surgeons, representing six continents and eight languages. Data fields were completed 98.9% of the time. There were significant differences in the demographic profile and experience of surgeons between regions (Table 1). A total of 54.8% of surgeons described the scope of their clinical practice as hepatopancreatobiliary (HPB) surgery, whereas just 3.6% said they practised pancreas surgery exclusively. Asian/Australian surgeons were significantly more likely to have an HPB-only practice compared with those in other regions ($P < 0.001$). The median age and years of experience as an attending surgeon were 45 years (IQR: 39–54 years) and 13 years (IQR: 6–22 years), respectively. Within the last year, surgeons had performed a median of 12 PDs (IQR: 6–25 PDs). Their median cumulative career volume amounted to 80 PDs (IQR: 30–200 PDs); consequently, only 35.5% of responding surgeons were considered to have a high-volume PD practice (i.e. ≥ 20 PDs per year).¹⁰ This designation was most common in North America (50.0%), and least common in South/Central America (8.0%). Interestingly, only 53.8% of all surgeons had surpassed the learning curve for open PD, which has been reported to peak at 60 PDs.¹¹ Nearly two-thirds of North American surgeons had exceeded this threshold, compared with fewer than a quarter of South American/Mexican surgeons ($P < 0.001$).

Operative approaches

Around a third of surgeons across the world use the same pancreatoenteric reconstruction in every case. Pancreatojejunostomy (PJ) was the preferred anastomotic technique (88.7%) (Table 2) and was favoured by 96.4% of North American surgeons. Conversely, PG was selected by less than one-tenth of all respondents: European/African/Middle Eastern surgeons demonstrated the greatest proclivity for this technique (16.5%; $P < 0.001$). Isolated Roux limb reconstruction was uncommon

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