ORIGINAL ARTICLE

Meta-analysis of pancreaticogastrostomy versus pancreaticojejunostomy on occurrences of postoperative pancreatic fistula after pancreaticoduodenectomy

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Summary *Background/Objective:* Pancreatic fistula (PF) is the most common and challenging complication after pancreaticoduodenectomy (PD). This meta-analysis aimed to evaluate the impact of pancreaticogastrostomy (PG) versus pancreaticojejunostomy (PJ) on occurrences of postoperative PF.
Methods: A systematic literature search in the Medline, EMBASE, OVID, and Cochrane databases was performed to identify all eligible randomized controlled trials (RCTs). Pooled estimates were presented with 95% confidence intervals (CI).
Results: Six RCTs involving 1005 patients met the inclusion criteria. The incidence of PF [odds ratio (OR) 0.58, 95% CI, 0.42—0.81; $p = 0.001$], intra-abdominal abscess or collections (OR 0.43, 95% CI, 0.28—0.65; $p < 0.001$), and biliary fistula (OR 0.28, 95% CI, 0.11—0.74; $p = 0.01$) were found to be significantly lower in the PG group than in the PJ group. There was no significant difference in overall morbidity, other complications, hospital mortality, or length of hospital stay between the two groups.
Conclusion: The meta-analysis showed that PG following PD represents a safe procedure associated with fewer PFs compared with PJ.
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Conflicts of interest: The authors declare that they have no potential competing interests.
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1. Introduction

As a result of recent improvements in surgical techniques and perioperative care, pancreaticoduodenectomy (PD) has been refined to be a safe operation with <5% perioperative mortality at high-volume centers, however, the morbidity rate remains as high as 20–50%.[1] Pancreatic fistula (PF) is the most devastating postoperative complication occurring in 2.5–25% patients,[2] and has become the main reason for increased morbidity and mortality, prolonged length of hospital stay, and increased medical costs.

After PD, pancreatic continuity can be restored by performing either a pancreaticojejunostomy (PJ) or a pancreaticogastrostomy (PG). A recent published meta-analysis[3] of four randomized controlled trials (RCTs)[4–7] showed no significant difference between the two surgical modalities in terms of PF occurrence. By contrast, two more recent large-scale RCTs[8,9] reported that the PF rate with PG was lower than that with PJ. In the light of these conflicting findings, the present meta-analysis was attempted to provide a more updated evaluation of the effect of PG versus PJ with respect to the PF rate after PD.

2. Methods

The study was conducted following the Preferred Reporting Items for Systematic Reviews and Meta- Analyses (PRISMA).[10]

2.1. Study selection

Systematic literature searches in the Medline, EMBASE, OVID, and Cochrane databases were performed to identify published RCTs that compared the postoperative PF rate with PG versus PJ after PD from database inception to November 2013. The Medical Subject Heading (MeSH) search terms were "PD," "pancreaticojejunostomy", and "pancreaticogastrostomy". Only studies on humans and in the English language were considered for inclusion. Reference lists of all retrieved articles were manually searched for additional studies.

2.2. Data extraction

Two reviewers (B.L. and L.W.) independently extracted the following parameters from each study: first author, year of publication, study population characteristics, number of patients randomized with each procedure, and endpoints. All relevant text, tables, and figures were reviewed for data extraction.

2.3. Criteria for inclusion and exclusion

RCTs that compared PG and PJ in patients undergoing PD for malignant and benign diseases of the pancreas and periampullary region were included in this review. Exclusion criteria were: animal studies, studies evaluating patients who underwent total pancreatectomy or central pancreatectomy, studies evaluating patients who underwent PD without immediate pancreatic anastomosis or duodenum-preserving pancreatectomy, and nonrandomized observational clinical studies.

2.4. Assessment of methodological quality

The RCTs were scored using the Jadad composite scale[11] in which each study was evaluated by examining three factors: randomization, blinding, and withdrawals and dropouts reported within the study period. The quality scale ranged from 0 points to 5 points, and a study with a score of ≥3 points was considered to be of high quality.

2.5. Endpoints

The primary endpoint was PF. PF was determined according to the consensus definition proposed by the International Study Group of Pancreatic Fistula (ISGPF),[12] as the presence of amylase-rich fluid (>3 times the upper limit of normal in the serum) of any measurable volume on or after postoperative Day 3. The severity of PF was classified into three grades as follows: Grade A fistulas were transient and did not require any intervention; Grade B fistulas required adjustment to the clinical pathway but the patients were clinically well; and Grade C fistulas often required operative intervention and were associated with sepsis or death.

Secondary endpoints included overall morbidity, other complications, hospital mortality, and length of hospital stay.

2.6. Statistical methods

Review Manager (RevMan) software 5.0 (Nordic Cochrane Centre, Copenhagen, Denmark) was used to conduct all analyses. Odds ratio (OR) and weighted mean differences (WMD) were used for the analysis of continuous and dichotomous variables, respectively. If the study provided medians and interquartile ranges instead of means and standard deviations (SDs), the means and SDs were imputed according to the methods described by Hozo et al.[13] Pooled estimates were presented with 95% confidence intervals (CI). Pooled effect was calculated using either the fixed effects model or random effects model. Heterogeneity was evaluated using I^2, with values >50% indicating considerable heterogeneity. Publication bias was assessed visually using a funnel plot, based on the results of PF.

3. Results

3.1. Eligible studies

We identified 1837 potentially relevant records. After excluding studies that did not fulfill our inclusion criteria, six articles were retrieved for inclusion (Fig. 1).[4–9] The two reviewers had 100% agreement in their reviews of the data extraction.

A total of 1005 patients were included in the meta-analysis: 503 in the PG group and 502 in the PJ group. Of the six included studies, two were conducted in Spain,[7,8] one in the USA,[4] one in Italy,[5] one in France,[6] and one in Belgium.[9] The sample size of each study varied from 108 patients to