REVIEW ARTICLE

A systematic review of radical antegrade modular pancreatosplenectomy for adenocarcinoma of the body and tail of the pancreas

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Abstract

Background: To assess the published evidence on clinical outcomes following radical antegrade modular pancreatosplenectomy (RAMPS) for adenocarcinoma in the body or tail of the pancreas.

Method: PubMed and Chinese Biomedical Literature databases were searched. The results of comparisons between RAMPS and standard retrograde pancreatosplenectomy (SRPS) were analyzed by meta-analytical techniques.

Results: The literature search identified 13 observational studies involving 354 patients undergoing RAMPS. The overall morbidity and 30-day mortality was 40% and 0% respectively. The R0 resection rate was 88%; the median number of retrieved lymph nodes was 21; and the median 5-year overall survival rate was 37%. The result of meta-analysis showed that RAMPS was associated with a significantly less intraoperative bleeding [weighted mean difference −195.2 (95% confidence interval (CI) −223.27 to −167.13); $P < 0.001$], a greater number of retrieved lymph nodes [odds ratio (OR) 6.19 (95% CI 3.72 to 8.67); $P < 0.001$] and a higher percentage of R0 resection [OR 2.46 (95% CI 1.13 to 5.35); $P = 0.02$] as compared with SRPS.

Conclusion: The current literature provides supportive evidence that RAMPS is a safe and effective procedure for adenocarcinoma in the body or tail of the pancreas, and is oncologically superior to SRPS.

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Introduction

Adenocarcinoma in the body or tail of the pancreas is conventionally resected by the standard retrograde pancreatosplenectomy (SRPS) performed in the left-to-right direction with mobilization of the spleen first, and then resection of the posterior aspect of the pancreas from the tail to the body. However, SRPS is associated with a high positive tangential margin rate, devoid of the described lymph node drainage of the organ. To overcome these problems, Strasberg *et al.*[1] in 2003 introduced a modified technique of SRPS called radical antegrade modular pancreatosplenectomy (RAMPS) in which division of the neck of the pancreas and splenic vessels and a celiac node dissection are performed first, followed by dissection proceeding from right-to-left in 1 of the 2 posterior dissection planes, depending on the extent of penetration of the tumor. However, only a few studies have reviewed the experience and practice of RAMPS.[2–10] In addition, data comparing this procedure with SRPS are limited, and therefore the potential value of RAMPS has not been clearly demonstrated. The aim of this systematic review was to assess the published evidence on clinical outcomes following RAMPS for adenocarcinoma in the body or tail of the pancreas.

Yanming Zhou and Bin Shi contributed equally to this work.

Methods

This study was performed in accordance with the guidelines of preferred reporting items for systematic reviews and meta-analyses (PRISMA) 2009.[11]

Literature search strategy and study identification

An electronic search was performed of the Pubmed and Chinese Biomedical Literature database from the date of the earliest report of RAMPS in 2003 to May 2016 using the following keyword: "radical antegrade modular pancreatosplenectomy." No language restriction was applied. Reference lists of relevant articles were further searched manually to check for additional studies. Studies reporting the outcomes following the RAMPS in patients with pancreatic adenocarcinoma were included for analysis. To ensure that the series reviewed reflect consistent surgical approach, only study involving more than 5 patients were included in the systematic review of overall outcome of RAMPS. Reviews, conference abstracts, non-human studies, case report were excluded. In cases of duplicated studies with overlapping patients, only the most recent publication with accumulating numbers of patients or increased lengths of follow-up was considered.

Two investigators (YZ and BS) independently appraised each eligible article using predefined criteria. Discrepancies between the two reviewers were resolved by discussion and consensus. Data were extracted on the first author, country, year of publication, sample size, study design, population characteristics, duration of operation, estimated blood loss, proportion of radical (R0) resection, morbidity, incidence and severity of pancreatic fistula as defined by the International Study Group on Pancreatic Fistula (ISGPF),[12] 30-day mortality, and survival. The level of evidence of each study was categorized according to the Evidence-Based Medicine Levels of Evidence.[13]

Statistical analysis

Descriptive statistics were performed and data are expressed as mean or median (interquartile range) where appropriate. A meta-analysis of the comparative studies of RAMPS and SRPS was undertaken with Review Manager (RevMan) software, version 5.1 (The Cochrane Collaboration, Software Update, Oxford). Odds ratio (OR) or weighted mean difference (WMD) with a 95% confidence interval (95% CI) were calculated for dichotomous variables and continuous variables respectively. Heterogeneity was assessed using the χ^2 test and I^2. When the heterogeneity was not significant (I^2 <50%), a fixed-effects model was used for the pooled analysis. Otherwise, a random-effects model was used. Statistical significance was set at $P < 0.05$.

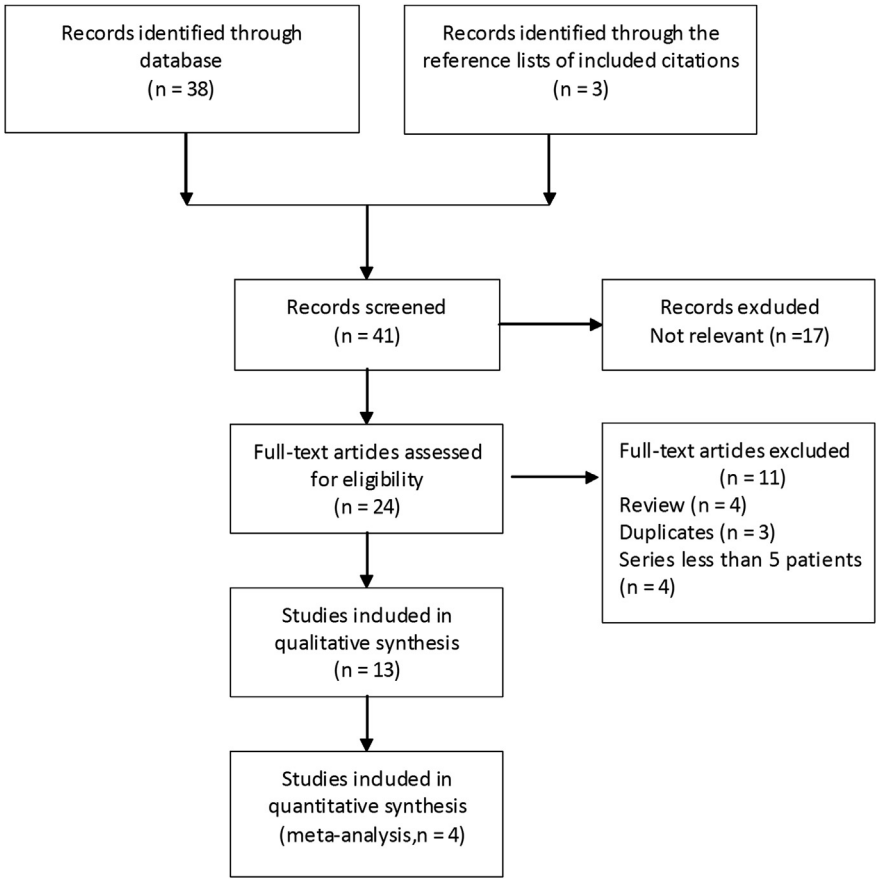

Figure 1 Study selection