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Review

Duodenopancreatectomy: Open or minimally invasive approach?



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ABSTRACT

Background: Minimally invasive pancreaticoduodenectomy (MIPD) is a complex procedure, offered to selected patients at institutions highly experienced with the procedure. It is still not clear if this approach may enhance patient recovery and reduce postoperative complications comparing to open pancreaticoduodenectomy (OPD), as demonstrated for other abdominal procedures.

Methods: A systematic literature review was conducted to identify studies comparing MIPD and OPD. Perioperative outcomes (e.g., morbidity and mortality, pancreatic fistula rates, blood loss) constituted the study end points. Metaanalyses were performed using a random-effects model.

Results: For the metaanalysis, 8 studies including 204 patients undergoing MIPD and 419 patients undergoing OPD were considered suitable. The patients in the two groups were similar with respect to age, sex and histological diagnosis, and different with respect to tumor size, rate of pylorus preservation, and type of pancreatic anastomosis. There were no statistically significant differences between MIPD and OPD regarding development of delayed gastric emptying (DGE), pancreatic fistula, wound infection, or rates of reoperation and overall mortality. MIPD resulted in lower post-operative complication rates, less intra-operative blood loss, shorter hospital stays, lower blood transfusion rates, higher numbers of harvested lymph nodes, and improved negative margin status rates. However, MIPD was associated with longer operating times when compared to OPD.

Conclusions: The MIPD procedure is feasible, safe, and effective in selected patients. MIPD may have some potential advantages over OPD, and should be performed and further developed by use in selected patients at highly experienced medical centers.

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Introduction

For a number of abdominal procedures, minimal-access surgery has been shown to reduce postoperative pain, increase patient mobility, enhance recovery, and facilitate early patient discharge, when compared with use of open surgery.^{1–4} Accordingly, laparoscopic approaches have proven to be feasible, safe, and oncologically equivalent to open procedures for treatment of many abdominal malignancies, and produce comparable postoperative and long-term outcomes.

Laparoscopic pancreatic surgery was initially used for staging of pancreatic neoplasms,⁵ but in recent years, advances in laparoscopic techniques, instruments, and experience have allowed surgeons to perform laparoscopic resection of the pancreas. Minimally invasive distal pancreatectomy (MIDP) has gained popularity among general and gastrointestinal surgeons because the procedure does not require anastomosis or other reconstruction, and presents fewer challenges than other major laparoscopic procedures.^{6,7} A study comparing patient outcomes following open and laparoscopic distal pancreatectomies showed reduced postoperative pain, faster recovery, fewer wound related problems, and decreased morbidity for patients receiving MIDP.⁸

MIPD, both laparoscopic and robotic, is a technically demanding procedure, requiring extensive retroperitoneal dissection around delicate vascular structures, and a prolonged reconstruction including three anastomoses.^{9,10} However, pancreaticoduodenectomy has a high morbidity rate (20–40%), mainly related to failure of the pancreatic anastomosis and delayed gastric emptying. The procedure also requires a long hospital stay (8–14 days), and it has been thought that a minimally invasive approach would not significantly shorten patient recovery time.^{11–13} Additionally, the complexity of pancreaticoduodenectomy necessitates a long operative time, which has been thought would be increased by a minimally invasive technique.^{14,15}

No randomized clinical trials have been conducted comparing MIPD with open pancreaticoduodenectomy (OPD); however, MIPD is offered to selected patients at institutions highly experienced with the procedure. While single institution retrospective studies comparing MIPD with OPD have been conducted, these studies were limited by small sample sizes and their single institution design. Therefore, we conducted a systematic review of the literature and a meta-analysis of the selected studies to compare surgical and oncologic outcomes of MIPD vs those achieved with OPD.

Methods

Study selection

A systematic literature search was performed using Embase, Medline, Cochrane, and PubMed databases to identify all studies published up to and including February 2013 that compared minimally invasive pancreaticoduodenectomy with open pancreaticoduodenectomy. The meta-analysis was conducted according to the QUORUM guidelines.¹⁶

Minimally invasive pancreaticoduodenectomy was defined as either a laparoscopic pancreaticoduodenectomy or a robotic-assisted laparoscopic pancreaticoduodenectomy. The following MESH search headings were used: “laparoscopic AND pancreaticoduodenectomy OR duodenopancreatectomy”, “minimally invasive AND pancreaticoduodenectomy OR duodenopancreatectomy”, “robotic AND pancreaticoduodenectomy OR duodenopancreatectomy”. The “related articles” function was used to broaden the search, and all abstracts, studies, and citations scanned were reviewed.

Inclusion criteria

Studies included in our analysis were required to¹: compare characteristics and perioperative outcomes of patients undergoing minimally invasive pancreaticoduodenectomy and open pancreaticoduodenectomy, and² involve a previously unreported patient group (if patient material was reported more than once by the same institution, the most informative and recent article was included in our analysis). We also included studies in which a portion of the reconstruction (mainly the pancreatic anastomosis) was done through a mini-laparotomy, which is always needed to remove a surgical specimen.

Exclusion criteria

The following types of studies were not considered for inclusion in our meta-analysis¹: studies in which the outcomes of interest (specified later) for both minimally invasive and open techniques were not reported or were impossible to calculate²; “how I do” articles, animal studies, and non-English language studies.

Data extraction

Two reviewers independently extracted the following information from each study: first author, year of publication, study population characteristics, study design, indications for operation, number of subjects who underwent an operation with each technique, rate of conversion from a minimally invasive to an open technique or hand-assisted technique, surgical techniques, and perioperative outcomes.

Outcomes of interest and definition

All studies were abstracted for the following relevant data: patient baseline characteristics (age, sex, and body mass index [BMI]), tumor characteristics (size, histology), type of procedure (standard pancreaticoduodenectomy, pylorus-preserving pancreaticoduodenectomy), technique of pancreatic anastomosis (pancreaticojejunostomy, gastrojejunostomy), operative outcomes (operative time, intraoperative blood loss, and conversion to hand-assisted or open surgery), extension of lymphadenectomy, resection margins, postoperative recovery time (duration of hospital stay), reoperation rate, and postoperative complications (morbidity and mortality).

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