ORIGINAL ARTICLE

Minimally invasive pancreatic resections: cost and value perspectives

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Abstract

Background: The number of minimally invasive pancreatic resections (MIPR) performed for benign or malignant disease, have increased in recent years. However, there is limited information regarding cost/value implications.

Methods: An international conference evaluating MIPR was held during the 12th Bi-Annual International Hepato-Pancreato-Biliary Association (IHPBA) World Congress in Sao Paulo, Brazil, on April 20th, 2016. This manuscript summarizes the presentations that reviewed current topics in cost and value as they pertain to MIPR.

Results: Compared to the open approach, MIPR's are associated with higher operative costs but lower postoperative costs. However, measurements of patient value (defined as improvement in both quantity and quality of life) and financial value (using incremental cost-effectiveness ratio) are required to determine the true value at societal level.

Conclusion: Challenges remain as to how the potential benefits, both to the patient and the healthcare system as a whole, are measured. Research comparing MIPR versus other techniques for pancreatectomy will require appropriate and valid measurement tools, some of which are yet to be refined. Nonetheless, the experience to date would support the continued development of MIPR by experienced surgeons in high-volume pancreatic centers, married with appropriate review and recalibration.

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Introduction

The number of minimally invasive pancreatic resections (MIPR) performed for benign and malignant disease have increased in recent years due to improved imaging and instrumentation, coupled with the increased dissemination of advanced laparoscopic and robotic surgical techniques, yet financial implications of these novel approaches are not well defined.

Presented at the IHPBA State of the Art Conference on Minimally Invasive Pancreatic Resection, April 20–23, 2016, Sao Paulo, Brazil.

Initial focus on MIPR was directed to left-sided resections with reductions reported in estimated blood loss, peri-operative pain and hospital stay compared to the standard open procedure.[1–3] Patient satisfaction appeared to be increased and there was a suggestion that time to adjuvant therapies was reduced.[4] Recent work has suggested that the benefits of a minimally invasive approach may also be realized by the more technically challenging procedure of pancreaticoduodenectomy (PD).[4,5] However, Nussmann and colleagues examined the National Cancer Database (NCDB) between 2010 and 2012 and noted that of

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7967 subjects, 1191 (14.9%) had a minimally invasive pancreaticoduodenectomy (MIPD). Compared to these patients who underwent an open procedure MIPD did not result in greater use or earlier initiation of adjuvant chemotherapy.[6] Age, insurance status, co-morbidity status and tumor were independently associated with the use of adjuvant chemotherapy.

While the economic implications of open pancreatic surgery are established, cost/benefit data for MIPR and incorporation of robotic technology remain ill defined.[7]

This manuscript summarizes the presentations at the first international State-of-the-Art Conference on Minimally Invasive Pancreatic Resection that reviewed current topics in cost and value as they pertain to MIPR.

Methods

An international "State-of-the-Art" conference evaluating MIPR was conducted by a group of international experts in the field of pancreas surgery during the 12th annual International Hepato-Pancreato-Biliary Association (IHPBA) World Congress in Sao Paulo, Brazil, on April 20th, 2016.[8] The conference organizing committee consisted of pancreatic surgeons who practiced only open pancreatic surgery as well as surgeons who also perform MIPR, both robotic and/or laparoscopic. A "Cost/Value" section, which is the subject of this manuscript was organized and chaired by Kevin Conlon, MD (Dublin Ireland). Faculty were chosen for this module based on recognized expertise with the various topics explored. Table 1 lists the presenters and topics.

A formal literature search for articles published in English regarding the cost of MIPR was conducted between 2008 and 2015. PubMed, Embase and the Cochrane Library were systematically searched using terms/key words based on the type of procedure, surgical approach and economic aspects (pancreatectom* OR pancreatic resection OR Whipple OR pancreaticoduodenectom* OR pancreatoduodenectom*) AND (laparoscop* OR robotic OR robot-assisted OR minimally invasive OR minimally-invasive OR hybrid) AND (cost OR costs OR cost-effective* OR economic*). Studies were included if they reported >10 patients per group. Overlapping cohorts were excluded.

Table 1 Cost/Value section

Presenter	Topic
Kevin Conlon	Introduction/Scope of session
Mohammad Abu-Hilal Thijs de Rooij Jony van Hilst	Cost analysis of MIPR
Tsafrir Vanounou	A framework for cost comparisons in MIPR moving forward: cost-effectiveness and beyond
Mark Talamonti	The Chairman's perspective on the development and implementation of a MIPR program: why and how?
Victor Velanovich	Quality of life considerations for MIPR
Julie Fleshman	The patient perspective

Cost-effectiveness of MIPR

Over the last decade, the cost effectiveness of MIPR, has been investigated by many authors.[9] The majority of which have focused on laparoscopic distal pancreatectomy (LDP) versus open distal pancreatectomy (ODP). Sixty-seven original studies were identified. There were no randomized-controlled trials. Nineteen observational studies were included. They consisted of 12 studies on DP: 10 LDP versus ODP (Table 2), 2 robotic distal pancreatectomy (RDP) versus ODP, and 7 studies on pancreaticoduodenectomy (PD): 3 laparoscopic versus open PD, 2 robot-assisted versus open PD, and 2 on combined procedures (laparoscopic resection with open reconstruction) versus open PD. The methodology quality was considered low (Newcastle–Ottawa scale <6).

Costs of distal pancreatectomy

To-date, 10 studies on laparoscopic versus open DP compared costs are available, of which eight studies assessed operative, postoperative and total costs separately. Details are shown in Table 1.

Five studies found significant differences in operative costs between the two approaches.[10,13,15–18] In four of them, LDP was associated with significantly increased operative costs up to 2800 USD,[10,13,15–18] which may be related to the higher costs of surgical equipment, and longer operative times for the laparoscopic approach.

A consistent benefit of LDP over ODP, shown in several meta-analyses, is the enhanced postoperative recovery resulting in a shorter length of hospital stay.[15,19] This is associated with comparable complication rates, which might account for lower postoperative costs after LDP when compared to ODP.[9] This hypothesis was confirmed in six of ten studies, in which a (6500 GBP) reduction in postoperative cost was seen.[3,10,13,15,17,18] Factoring in both operative and postoperative costs, total costs of LDP and ODP were comparable in most series.[3,10,11,13–15,17,18] In two studies, the reduction in postoperative costs failed to neutralize the higher intraoperative cost of the laparoscopic approach,[11,16] and only one study has reported on overall costs with the laparoscopic approach.[20]

One study assessed the influence of the implementation of an enhanced recovery program for laparoscopic DP. The implementation of this program decreased length of hospital stay by 3 days and resulted in a significant total cost reduction of 2000 GBP per patient ($P = 0.0004$).[21]

Two studies compared costs between LDP and RDP.[22,23] In both, a higher operative costs were reported in the RDP group, yet the study from Kang and co-workers found that overall cost (inclusive of postoperative costs) favors RDP.[23]

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