

# Palliative Laparoscopic Hepatico- and Gastrojejunostomy for Advanced Pancreatic Cancer

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## ABSTRACT

Only 10% to 20% of pancreatic tumors are resectable at the time of diagnosis. Patients with advanced disease have a median survival of 4.9 months. Palliation is often required for biliary or duodenal obstruction, or both, and for pain. Optimal palliation should guarantee the shortest possible hospital stay and as long a survival as possible with a good quality of life. In recent years, treatment options for palliation of biliary and duodenal obstruction due to pancreatic cancer have broadened. Endoscopic and percutaneous biliary stenting have been shown to be successful tools for safe palliation of high-risk patients. Nevertheless, fit patients with unresectable pancreatic cancer benefit from surgery, which allows long-lasting biliary and gastric drainage.

While laparoscopic cholecystojejunostomy and gastroenterostomy in patients with advanced pancreatic cancer have been widely reported, laparoscopic hepaticojejunostomy has been rarely described. In this article, we describe our technique of laparoscopic hepatico-jejunostomy and gastrojejunostomy. We also discuss current evidence on the indications for these procedures in patients with unresectable pancreatic cancer.

**Key Words:** Laparoscopy, Hepatico-jejunostomy, Gastroenterostomy, Pancreatic cancer.

## INTRODUCTION

The treatment of pancreatic carcinoma is almost entirely palliative. Only 10% to 20% of tumors are resectable at the time of diagnosis, and even in these patients, survival beyond 5 years can be anticipated in no more than 10%.<sup>1</sup> The median survival of patients with advanced disease is 4.9 months.<sup>2</sup> These data underscore the importance of an optimal palliation that will guarantee the shortest possible hospital stay and as long a survival as possible with a good quality of life.

Obstructive jaundice is the most common symptom requiring palliation, occurring in 70% of patients. Duodenal obstruction, occurring in 10% to 25% of patients, is rarely a presenting symptom (< 5%) and usually follows biliary obstruction.

The palliative treatment of carcinoma of the pancreas is difficult. Careful evaluation of the patient and multidisciplinary expertise are required to select the appropriate approach. Several risk factors are usually present: more than 50% of patients are over the age of 70 years, and they often have associated medical illnesses.<sup>3</sup> Jaundice and poor nutritional status can further compound the problems associated with the operative treatment. Although the mortality for palliative operations has recently improved, morbidity rates have remained high.<sup>4</sup>

Decision making in the palliation of jaundice and duodenal obstruction due to pancreatic cancer has become more complex in recent years. Treatment options have broadened with the advent of endoscopic and percutaneous stenting of the bile ducts and laparoscopic biliary and enteric bypass.

The availability of these minimally invasive techniques has also increased the demand for accurate staging. Resectability of pancreatic lesions is determined accurately by preoperative imaging in only 47% to 55% of cases.<sup>5</sup> Diagnostic laparoscopy and laparoscopic ultrasonography are indicated in patients whose tumor is deemed resectable on preoperative imaging.<sup>6</sup> Using laparoscopy and laparoscopic sonography, the resectability rate can be determined correctly in 75% to 100% of patients.<sup>7</sup> In other words, 33% to 65% of patients can be spared a negative laparotomy for unresectable

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disease.<sup>7</sup> False-positive results, ie, resectable lesions judged unresectable by staging laparoscopy, have not occurred in any of the prospectively reported controlled studies.<sup>6-8</sup> For these reasons, a laparoscopic approach to the palliation of advanced pancreatic cancer based on the findings of staging laparoscopy and laparoscopic ultrasonography may have the potential to replace open bypass procedures.

In this article, we describe the surgical technique for laparoscopic hepatico- and gastrojejunostomy and discuss the indications for these procedures in patients with advanced pancreatic cancer.

## SURGICAL TECHNIQUE

Although laparoscopic cholecystojejunostomy has been reported by many authors,<sup>9-14</sup> few have described laparoscopic hepatico-jejunostomy for the palliation of advanced pancreatic cancer.<sup>15,16</sup> Laparoscopic hepatico-jejunostomy is a difficult procedure, requiring expertise in advanced laparoscopy. Palliation of duodenal obstruction by laparoscopic gastrojejunostomy has also been widely described.<sup>17-19</sup>

When dealing with tumors deemed resectable on preoperative imaging, a complete laparoscopic evaluation of resectability, which includes laparoscopic ultrasonography, is performed. First, the liver is examined. The probe is positioned on the ventral surface of the liver with gentle pressure. The entire hepatic tissue is carefully searched for secondary lesions. The extrahepatic bile ducts and the vessels of the hepatoduodenal ligament are then scanned.



**Figure 1.** Using the stomach as an acoustic window, the pancreas is examined by laparoscopic ultrasonography.

Involvement of lymph nodes, the hepatic artery, and portal vein are noted. This is a crucial step of the intraoperative assessment of resectability. The presence or absence of tumor invasion into the major vessels, especially the portal vein, must be ruled out. Using the stomach as an acoustic window, the pancreas is then examined (**Figure 1**). The size and location of the tumor may be documented at this point of the procedure. Involvement of the mesenteric vessels and the celiac trunk is ruled out. The gastrocolic ligament is then opened with the Harmonic scalpel (Ethicon Endo-Surgery, Cincinnati, OH) and access to the anterior surface of the pancreas is achieved (**Figure 2**). The pancreatic lesion is usually identified, either by laparoscopy (**Figure 2**) or by laparoscopic ultrasonography (**Figure 3**).

Once the lesion is judged unresectable, and in the presence of an indication for palliation, laparoscopic side-to-side hepatico- and gastrojejunostomy, using a simple jejunal loop, are performed.

An antecolic gastrojejunostomy is preferred because it lessens the possibility of subsequent infiltration by a tumor. A small opening is made both into the posterior wall of the stomach and the jejunal loop with the Harmonic scalpel (**Figure 4**). The jaws of an Endo-GIA stapler (3.5 mm/30 mm, US Surgical, Norwalk, CT) are inserted into the enterotomies and a wide gastrojejunostomy is created by 3 firings of the stapler (**Figure 5**). The staple line is carefully inspected for bleeding and the enterotomies are closed with a running suture (**Figures 6 and 7**).



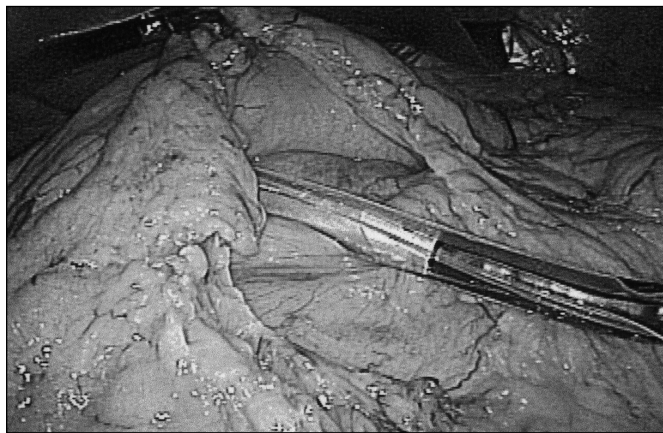
**Figure 2.** The gastrocolic ligament is opened and the probe is placed directly on the anterior surface of the pancreas.

The hepatoduodenal ligament is further dissected, and the common bile duct, cystic duct, and cystic artery are isolated. The cystic duct and the cystic artery are divided, and cholecystectomy is performed. The gallbladder is removed to facilitate construction of the common hepatic duct anastomosis and to prevent the possible later complication of cystic duct obstruction and cholecystitis. An incision of approximately 1 cm is performed on the common hepatic duct (**Figure 8**). If present, a hepatic duct drain is removed under direct vision (**Figure 9**). Using the same loop of jejunum that was selected for the gastrojejunostomy, a hepatico-jejunostomy is performed distal to the gastrojejunostomy. Two stay sutures are applied to fix the loop of jejunum to the common hepatic duct. A small enterotomy is performed on the intestinal wall. The jaws

of an Endo-GIA stapler (3.5 mm/30 mm, US Surgical, Norwalk, CT) are inserted into the common hepatic duct and the jejunal loop (**Figure 10**). Using a single firing of the stapler, the side-to-side anastomosis is created (**Figure 11**). The 2 openings are then closed with a running suture (**Figure 12**). A drain is left in situ.

## DISCUSSION

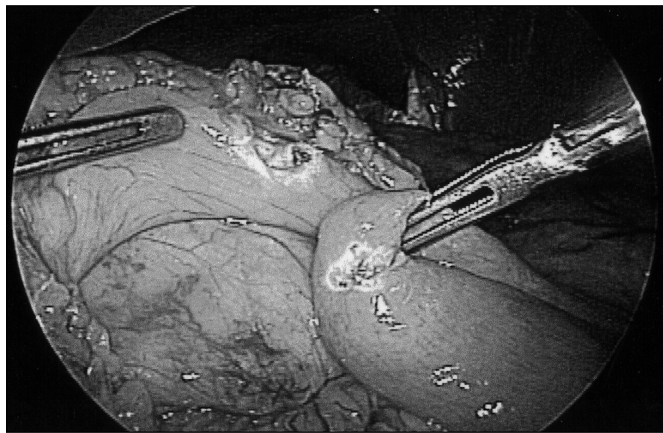
Optimal palliation should alleviate symptoms effectively, thereby improving the quality of life while reducing the duration of hospital stay. Palliation of patients with unresectable pancreatic cancer is aimed at 3 major symptoms: obstructive jaundice, duodenal/gastric outlet obstruction, and tumor-associated pain.



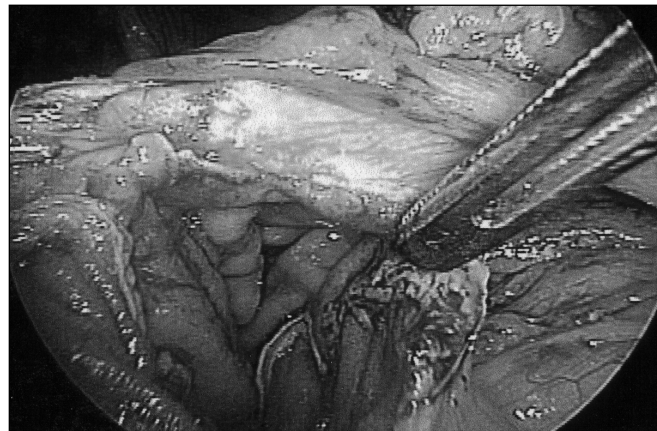
**Figure 3.** The tumor is identified.



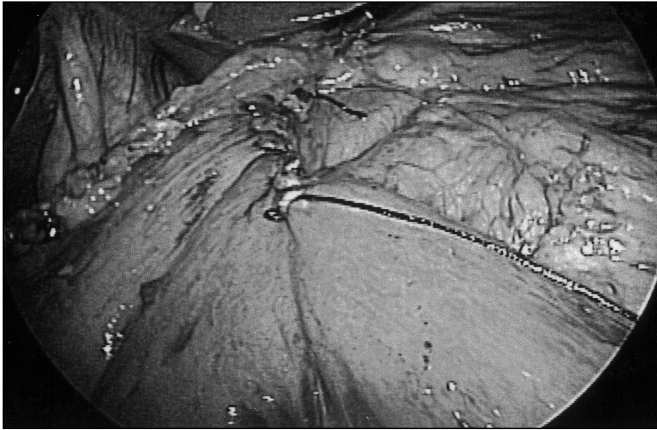
**Figure 5.** The jaws of an Endo-GIA are inserted into the enterotomies.



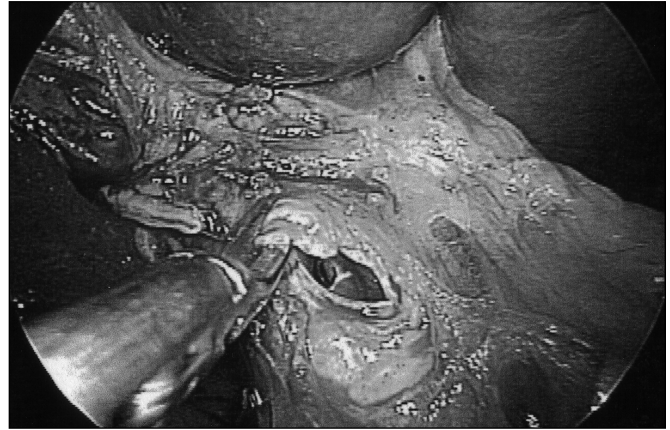
**Figure 4.** A small opening is made into the posterior wall of the stomach and the jejunal loop.



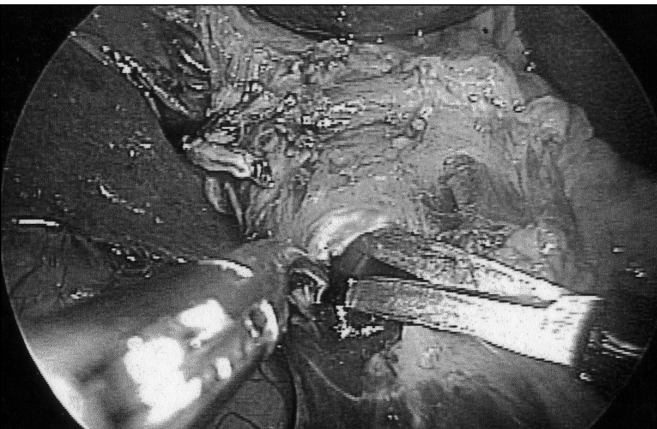
**Figure 6.** The staple line is inspected for bleeding.



**Figure 7.** The enterotomies are closed with a running suture.



**Figure 9.** An eventual hepatic duct drain is removed under visualization.



**Figure 8.** A small incision is performed on the common hepatic duct.

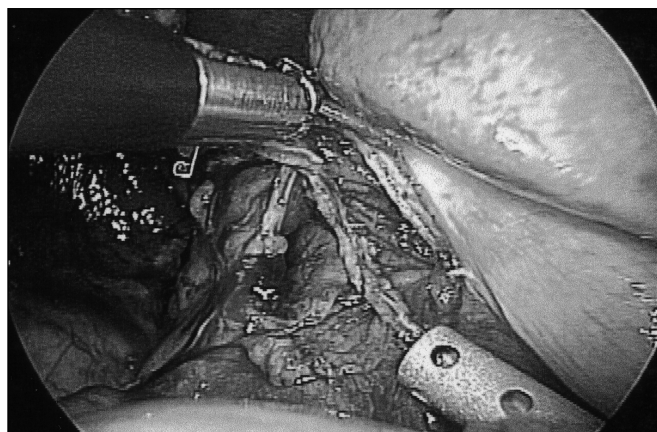


**Figure 10.** Insertion of the jaws of an Endo-GIA stapler into the hepatic duct and jejunum.

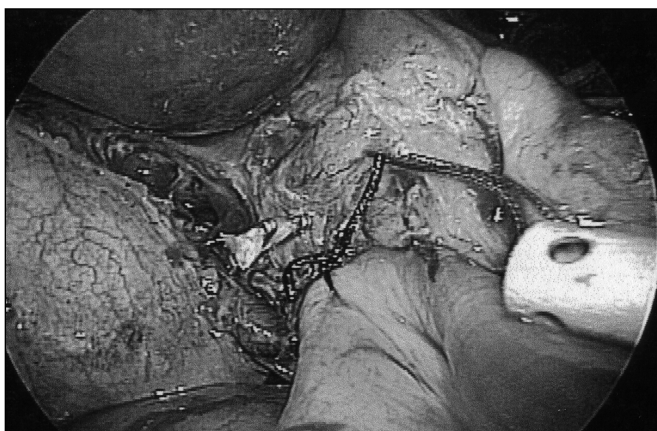
In a review of 8,000 patients in the English literature from 1965 to 1980,<sup>20</sup> the relief of biliary obstruction with surgical biliary bypass was associated with longer and more comfortable survival (5.4 months) when compared with diagnostic laparotomy alone (3.5 months). For these reasons, an attempt to palliate biliary obstruction is indicated in all but the most terminal patients.

Open palliative surgery has been associated with high mortality and morbidity rates (8% to 33% and 20% to 60%, respectively).<sup>4,11</sup> The introduction of endoscopic and percutaneous stenting of the bile ducts has changed the management of these patients. Several randomized studies compared biliary stenting with open bypass proce-

dures.<sup>21-23</sup> Morbidity, mortality, and primary hospital stay were found to be lower after stenting. In particular, a randomized comparative trial (surgical vs. endoscopic palliation of jaundice) was conducted at the Middlesex Hospital in London.<sup>24</sup> In the study, 204 patients were randomized to either surgery (n = 103) or endoscopic stent placement (n = 101). Technical success was achieved in 94% and 95% of surgical and stent patients, respectively. Stented patients experienced lower procedure-related mortality (3% vs. 14%;  $P = 0.01$ ), major complication rate (11% vs. 29%;  $P = 0.02$ ), and median total hospital stay (20 vs. 26 days;  $P = 0.001$ ). However, recurrent jaundice occurred in 36 stented patients and only 2 surgical patients. Median survival was similar in the 2 groups



**Figure 11.** Firing the stapler, a side-to-side hepatico-jejunostomy is created.



**Figure 12.** The 2 openings are closed with a running suture.

(surgical = 26 weeks, stent = 21 weeks;  $P = 0.065$ ). The authors concluded that endoscopic stenting is easier and safer, but surgical bypass provides more durable relief of jaundice. The endoscopic approach, also when compared with percutaneous stenting, demonstrated significantly higher success rates and lower mortality.<sup>25</sup> As for unilateral versus bilateral endoscopic hepatic duct drainage in patients with malignant biliary obstruction, the results of a prospective, randomized study demonstrated that the insertion of more than 1 endoprosthesis is not routinely justified.<sup>26</sup> Single stent insertion proved to be effective, while avoiding the risk of further procedure-related complications and mortality. The major dis-

advantage of endoscopic stents is their short-life patency. The recurrent jaundice rate ranges from 5% to 24%.<sup>27</sup>

These data suggest that fit jaundiced patients with unresectable pancreatic cancer benefit from surgery, whereas poor operative risk patients should be treated with endoscopic or percutaneous stenting.

Current opinion is divided regarding the preferred surgical procedure for biliary-enteric bypass. In an analysis of 600 patients who underwent open biliary bypass in 8 reported series,<sup>28</sup> 93 of 400 patients (23%) developed recurrent jaundice after cholecystojejunostomy compared with 14 of 200 patients (7%) after hepatico-jejunostomy. In a prospective controlled trial assessing the efficacy of biliary enteric bypass,<sup>29</sup> 31 patients were randomized to cholecystojejunostomy and hepatico-jejunostomy. Seven bypasses failed after use of the gallbladder and only 2 after using the bile duct ( $P < 0.04$ ). Prior to death, 47% of cholecystojejunostomies failed. The authors concluded that hepatico-jejunostomy is a significantly more effective palliative procedure. A meta-analysis by Watanapa and Williamson<sup>30</sup> found that cholecystojejunostomy had an 89% success rate, whereas the success rate for hepatico-jejunostomy was 97%. More importantly, recurrent jaundice or cholangitis occurred in 20% of patients undergoing cholecystojejunostomy. On the basis of these data, most authors have preferred the routine use of the common bile duct for palliative biliary drainage.

The issue of duodenal obstruction, its management, and treatment in patients with advanced pancreatic cancer has been addressed by 3 meta-analyses.<sup>20,30,31</sup> Sarr and Cameron<sup>20</sup> reviewed more than 8000 surgically managed patients with unresectable pancreatic cancer. Thirteen percent of those who did not undergo a bypass procedure at their initial operation required gastrojejunostomy prior to death, and an additional 20% died with symptoms of duodenal obstruction. Another meta-analysis<sup>30</sup> included 1600 patients and reported a 17% incidence of duodenal obstruction at a mean of 8.6 months after the initial operation, requiring gastrojejunostomy before death. Singh and Reber<sup>31</sup> analyzed 950 patients with advanced pancreatic cancer. Twenty-one percent required late gastrojejunostomy. In all analyses, the addition of gastrojejunostomy at the initial operation did not increase operative mortality. Conversely, when gastrojejunostomy was performed as a second operation, the mortality rates approached 25%.

Despite these data, controversy still exists over the role of prophylactic gastrojejunostomy in these patients. Espot and colleagues<sup>32</sup> analyzed 155 laparoscopically staged patients with unresectable pancreatic carcinoma. They received no biliary and gastric bypass procedures and were prospectively followed to determine the frequency of subsequent gastric or biliary bypass, or both, required prior to death. The study revealed that 98% (152 of 155) of these patients did not require a subsequent procedure to treat biliary or gastric obstruction. However, 35% of patients in this study had tumors in the body and tail of the pancreas, which represents a group with differing needs for palliation. In a recent, prospective, randomized trial, the need of prophylactic gastrojejunostomy in advanced pancreatic cancer was evaluated.<sup>33</sup> Eighty-seven patients with no evidence of duodenal obstruction were randomized to receive either a gastrojejunostomy (44 patients) or no gastrojejunostomy (43 patients). Gastrojejunostomy did not influence morbidity, mortality, and length of hospital stay. No patients experienced late gastric outlet obstruction in the gastrojejunostomy group, whereas 19% of patients in the no-gastrojejunostomy group required bypass for gastric outlet obstruction ( $P < 0.01$ ). This study provided class I evidence confirming the need for routine gastrojejunostomy in surgically explored patients with unresectable pancreatic cancer.

The use of minimally invasive operative techniques has been applied to the management of pancreatic cancer. The role of diagnostic laparoscopy and laparoscopic ultrasonography for the intraoperative staging of pancreatic carcinoma has been well established and is the routine at advanced centers.<sup>7</sup> To date, many reports have described the use of laparoscopic techniques for palliation of patients with advanced pancreatic cancer.<sup>9-19</sup> These include laparoscopic hepatico-jejunostomy, cholecystojejunostomy, and gastrojejunostomy. Initial results demonstrate technical success, with acceptable morbidity and mortality and encouraging outcomes. In a case-controlled study, laparoscopic gastroenterostomy and end-to-side hepatico-jejunostomy (Roux-en-Y) were performed in 14 unresectable patients.<sup>15</sup> The results were compared with those of 14 matched patients who had conventional palliative procedures. Postoperative morbidity was 7% and 43% for laparoscopic and open palliation, respectively ( $P < 0.05$ ). No deaths occurred in the laparoscopic group, compared to 29% in the open group ( $P < 0.05$ ). Mean postoperative

hospital stay was 9 days in the laparoscopic group and 21 days in the open group ( $P < 0.06$ ). Morphine derivatives were necessary for a significantly shorter period following laparoscopic palliation ( $P < 0.03$ ). These results strongly support the use of a laparoscopic approach to palliation of advanced pancreatic cancer. Reduced pain and early reinitiation of normal bowel motility after laparoscopy may contribute to the lower incidence of cardiopulmonary complications leading to postoperative deaths in these high-risk patients.

Another study compared the short-term outcomes of open gastrojejunostomy (22 patients) to laparoscopic gastrojejunostomy (9 diagnosis-matched controls) for the palliation of gastric outlet obstruction caused by advanced pancreatic cancer.<sup>18</sup> Mortality, overall morbidity, operating time, time to oral solid food intake, nonsteroidal antiinflammatory drug consumption, opioid consumption, and survival were not significantly different between the 2 groups. Estimated blood loss and hospital stay were significantly reduced in the laparoscopic group ( $P < 0.01$  and  $P < 0.05$ , respectively). Delayed gastric emptying had played a major role in prolonged hospital stay after open palliation, being found in 12% to 67% of cases.<sup>27</sup> After laparoscopic palliative procedures, this complication has only rarely been reported.

Further clinical trials will be needed to demonstrate an evidence-based advantage of the laparoscopic approach to palliation of patients with advanced pancreatic cancer. To date, in patients deemed resectable on preoperative imaging, a diagnostic laparoscopic approach seems reasonable. Furthermore, with laparoscopic ultrasonography, intraoperative staging can be extremely accurate.<sup>6,7</sup> Unresectable patients may be further palliated by operative laparoscopic bypass. The technique described in this article for laparoscopic double bypass is technically challenging but has the potential to allow for a minimally invasive and durable biliary and gastric drainage. Currently, the laparoscopic approach for palliation of advanced pancreatic cancer is commonly used in advanced minimally invasive centers. Fit patients can be spared an unnecessary laparotomy while receiving long-lasting biliary or gastric drainage, or both, through a surgical stoma. Whether this minimally invasive approach will be extended to a larger number of centers and patients is yet to be determined.

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