



## Is There a Place for Gastroenterostomy in Patients with Advanced Cancer of the Head of the Pancreas?

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There remains doubt about the need for gastroenterostomy in patients with advanced cancer of the pancreatic head, performed either prophylactically or when passage of food becomes impossible. The records of 142 patients admitted for advanced pancreatic cancer to the Erasmus University Hospital over a period of 11 years were reviewed. We concentrated especially on the pre- and postoperative intake of food in cases involving gastroenterostomy and the morbidity and mortality associated with abdominal surgery in these patients. Of 129 patients without symptoms of gastric outlet obstruction at the time of diagnosis, 31 underwent prophylactic gastroenterostomy. The procedure did not prevent gastric outlet obstruction in 4 patients. Of the remaining 98 patients, 15 developed gastric outlet obstruction. Cox proportional hazards analysis showed no significant difference in the interval to the occurrence of a symptomatic obstruction between these two groups, taking into account other covariables. Postoperative complications and mortality regarding a gastroenterostomy were high, ranging from 9% to 41% and 11% to 33%, respectively. Our results do not indicate that prophylactic gastroenterostomy may significantly prevent future gastric outlet obstruction; therefore, as it also increases morbidity, it should not be performed. A gastroenterostomy to relieve symptoms should be considered carefully, as the success rate is low and is accompanied by a considerable incidence of morbidity and mortality.

The number of patients with cancer of the head of the pancreas and the periampullary region is increasing [1]. About 10% to 15% can be treated surgically with the intention of cure, which results in a median survival time of 17 to 20 months [2-4]. Patients with advanced tumors carry a poor prognosis. The median survival time of such patients is approximately 4 to 6 months, and 90% of the patients are dead within 1 year of the time from diagnosis [4-6]. In case of locally irresectable tumors without distant metastases, prolonged survival may be obtained by treatment with radiotherapy and 5-fluorouracil [7]. Because most patients cannot be cured, palliative therapy plays an important role in the treatment of these patients in terms of relieving pain, cholestasis, and obstruction of the duodenum.

Biliary bypass and biliary stent are obligatory procedures, as they decrease morbidity [8, 9]. There is still doubt, however, about the need for bypassing the duodenum in those patients

who are having problems with the passage of food. When vomiting minimalizes the intake of food, it is common practice to perform gastroenterostomy. It remains uncertain, however, as to whether prophylactic gastroenterostomy is good palliation for a possible future obstruction of the duodenum. Not all patients develop passage problems; and even those patients who are treated prophylactically are not always secured against gastric outlet obstruction, perhaps partly due to impairment of the innervation of the stomach caused by tumoral invasion. Therefore the problem of the passage of food is also thought to be a functional problem rather than a matter of obstruction of the duodenum by tumor growth. The aim of this study was to analyze the results of bypass procedures of the duodenum, performed on a prophylactic or therapeutic basis, in patients with advanced cancer in the pancreatic head.

### Materials and Methods

All the records of patients with advanced cancer of the head of the pancreas and periampullary region admitted to the Erasmus University Hospital between January 1, 1980 and December 31, 1990 were reviewed. Advanced cancer was defined as locally nonresectable tumors, distant metastases, or both. The definitive diagnosis of pancreatic cancer was confirmed after pancreatic biopsy, biopsy of a metastatic lesion with evidence of a primary lesion in the head of the pancreas, or autopsy. Patients with no histologically proved carcinoma but with obvious signs of cancer in the head of the pancreas, determined by radiologic imaging techniques and a supportive clinical course, were also included. Excluded were patients who had previously had gastric surgery.

We also obtained data on the techniques used to bypass the common bile duct and duodenum. A gastroenterostomy was performed transmesocolically, isoperistaltically, and with a single-layer running suture. Biliodigestive bypasses (BDBs) were performed by surgical methods (cholecystoduodenostomy, choledochoduodenostomy, and choledochojejunostomy) or other procedures (percutaneous drainage, nasobiliary drainage, and stents in the common bile duct).

We especially assessed pre- and postoperative problems of

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**Table 1.** Patient characteristics according to bypass procedure.

Procedure	No.	♀/♂	Mean age and range (years)	M <sub>0</sub>	M <sub>1</sub>
No bypass	28	13/15	61.5 (36–80)	15	13
GE	4	1/3	56.8 (49–74)	2	2
BDB	66	27/39	65.3 (37–89)	43	23
GE + BDB	44	22/22	60.8 (38–88)	28	16
<b>Total</b>	<b>142</b>	<b>63/79</b>	<b>63.0 (36–89)</b>	<b>88</b>	<b>54</b>

GE: gastroenterostomy; BDB: biliodigestive bypass (stents, drains, and surgical methods); M<sub>0</sub>: no metastases; M<sub>1</sub>: metastases.

food intake in cases involving gastroenterostomy. We defined gastric outlet obstruction as problems with the passage of food leading to vomiting and causing dehydration and malnutrition, necessitating parenteral administration of fluids. If the patient had preoperative signs of gastric outlet obstruction, we regarded the gastroenterostomy as having been performed for symptomatic reasons. Operative morbidity was measured by the incidence of surgical complications and the number of days gastric suction was needed, the time elapsed until a normal diet could be resumed, and the time spent in hospital after operation.

Follow-up information regarding gastric outlet obstruction, metastases, and hospital admissions concerning other palliative therapies was obtained. Data on metastases were obtained by histologic examination of biopsy specimens, computed tomographic (CT) scans, or ultrasonography. Statistical significance was determined by the use of the chi-square test and Fisher's exact test for cross tables and analysis of variance and the Student-Newman-Keuls test for normally distributed variables. For abnormally distributed variables, rank tests were used (Mann-Whitney, Kruskal-Wallis). Time to event data were analyzed using Cox proportional hazards analysis. A *p* value of <0.05 was considered to indicate a significant difference.

**Results**

*Patients*

Between 1980 and 1990 we admitted 149 patients with advanced cancer of the head of the pancreas to the Erasmus University Hospital. Seven of these patients had had previous gastric surgery and were excluded from further analysis. The remaining 142 patients were divided according to the options for palliative treatment. The characteristics of these patients are described in Tables 1 and 2. Age was significantly higher in patients who did not have a laparotomy. There were no other differences in the various treatment groups with regard to sex or the presence of metastases. Diagnosis was proved histologically in 116 patients (82%).

*Gastric Outlet Obstruction*

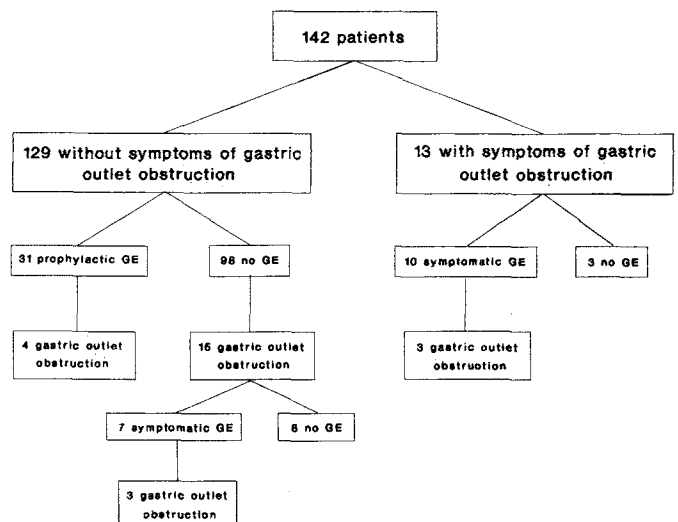
Thirteen patients had symptoms of gastric outlet obstruction (Fig. 1) at admission. Of these patients, 10 underwent gastroenterostomy. Two patients died soon after diagnosis, and one refused further treatment; 129 patients had no symptoms of gastric outlet obstruction at the time of diagnosis. Thirty-one

**Table 2.** Patient characteristics according to surgical bypass procedure.

Procedure	No.	♀/♂	Mean age and range (years)	M <sub>0</sub>	M <sub>1</sub>
No laparotomy	49	17/32	67.8* (36–89)	34	15
Laparotomy	31	17/14	61.6 (41–77)	18	13
SBDB	14	6/8	57.4 (37–77)	6	8
Prophylactic GE	9	5/4	59.1 (38–73)	4	5
Symptomatic GE	11	4/7	60.9 (49–74)	9	2
Prophylactic GE + SBDB	22	13/9	62.7 (41–88)	13	9
Symptomatic GE + SBDB	6	1/5	55.3 (40–76)	4	2
<b>Total</b>	<b>142</b>	<b>63/79</b>	<b>63.0 (36–89)</b>	<b>88</b>	<b>54</b>

GE: gastroenterostomy; SBDB: surgical biliodigestive bypass; M<sub>0</sub>: no metastases; M<sub>1</sub>: metastases.

\**p* < 0.05.



**Fig. 1.** Disposition of 142 patients with advanced cancer of the head of the pancreas.

**Table 3.** Development of gastric outlet obstruction in the 129 patients without symptoms at the time of diagnosis.

Condition	No. of patients	Gastric outlet obstruction	Median follow-up and range (days)	Person-years follow-up
No GE	98	15 (15.3%)	137 (7–589)	48.1
Prophylactic GE	31	4 (12.9%)	168 (12–1569)	22.7

GE: gastroenterostomy.

patients underwent prophylactic gastroenterostomy, but in four patients it could not prevent gastric outlet obstruction. Of the remaining 98 patients without gastroenterostomy, 15 developed symptoms of gastric outlet obstruction. Cox proportional hazards analysis of these data showed no significant difference in time to occurrence of symptomatic obstruction between these groups, taking into account sex, age, and the presence of metastases as covariables (*p* = 0.401) (Table 3).

These 15 patients who developed gastric outlet obstruction at a later stage all required hospitalization; 7 underwent gastroen-

**Table 4.** Morbidity and mortality after 100 elective laparotomies in 93 patients.

Procedure	No. of patients	No. of laparotomies	In-hospital mortality	Postoperative complications	
				No. (%)	Description
Laparotomy	31	37	6 (16.2%)	4 (10.8%)	Wound infections (2) GI bleeding Perforation of the small bowel
SBDB	14	15	1 (6.7%)	7* (46.7%)	Bile leakage (2) Intraabdominal bleeding (2) Fascia dehiscence (2) Gastric retention
Prophylactic GE	9	9	1 (11.1%)	2 (22.2%)	Nonfunctional GE Pancreatitis with pancreaticocutaneous fistula
Symptomatic GE	11	11	3 (27.3%)	1 (9.1%)	Nonfunctional GE
Prophylactic GE + SBDB	22	22	4 (18.2%)	9* (40.9%)	Intraabdominal bleeding (3) Nonfunctional SBDB (3) SBDB anastomotic leakage (2) Fascia dehiscence
Symptomatic GE + SBDB	6	6	2 (33.3%)	1 (16.7%)	SBDB anastomotic leakage and intraabdominal bleeding
<i>Total</i>	93	100	17 (17%)	24 (24%)	

GE: gastroenterostomy; SBDB: surgical biliodigestive bypass; GI: gastrointestinal.

\* $p < 0.05$ .

terostomy, which was successful in only 4 cases. Of these 7 patients, 2 had postoperative complications. In 1 patient the gastroenterostomy never functioned, and he died after 21 days; the other patient had anastomotic leakage and relaparotomy was necessary. The other 8 patients did not undergo gastroenterostomy owing to their terminal condition. The median survival of these patients was 13 days after the development of gastric outlet obstruction versus 58 days for the 7 patients with a gastroenterostomy. In the group with a prophylactic gastroenterostomy, 4 patients developed gastric outlet obstruction. The median survival of these 4 patients was 28 days after the development of the obstruction.

### Morbidity and Mortality

One hundred elective laparotomies were performed in 93 patients. A comparison of postoperative morbidity among the various treatment groups showed a significantly higher rate of complications after surgical biliodigestive bypass ( $p = 0.013$ ) and the bypass in combination with a prophylactic gastroenterostomy ( $p = 0.015$ ) compared with the other operative procedures. In-hospital mortality was not significantly different after the various palliative operations (Table 4).

Whether a gastroenterostomy was performed prophylactically or when symptoms of gastric outlet obstruction had arisen did not have a significant influence on the number of days during which gastric suction was needed, the time at which oral liquids or a normal diet could be taken, or the number of days spent in the hospital postoperatively (Table 5).

### Survival

All patients died during the follow-up time. Median survival of all patients was 4.5 months with a mean of 6.3 months (range 0.2–51.6 months). Patients with a biliodigestive bypass ( $n = 110$ ) had a significantly prolonged survival time in comparison to patients without a biliodigestive bypass ( $n = 32$ ) ( $p = 0.024$ ): Median survival was 2.4 months and 5.1 months, respectively.

**Table 5.** Postoperative dietary problems in patients after prophylactic or symptomatic gastroenterostomy.

Procedure	Gastric suction, median and range (days)	DGE (no. of patients)	Start of liquid diet after operation, median and range (days)	Start of normal diet after operation, median and range (days)
Prophylactic GE ( $n = 31$ )	3 (1–42)	5	5 (2–42)	8 (5–43)
Symptomatic GE ( $n = 17$ )	5 (1–12)	5	7 (1–37)	12 (3–65)

DGE: delayed gastric emptying (the inability to tolerate oral fluids 8 days or more after operation); GE: gastroenterostomy.

There was no statistical difference between patients with or without a biliodigestive bypass in regard to the occurrence of metastases. Other palliative procedures had no effect on survival, neither was there a difference in survival between patients who did and those who did not develop gastric outlet obstruction.

### Hospital Admissions

The number of hospital admissions during the survival interval is the same in all groups, averaging two admissions per patient. The percentage of days of survival spent in hospital is not significantly different in the various groups.

### Discussion

The correct palliative treatment for patients with advanced pancreatic cancer remains uncertain. Because it is known that biliary bypass for jaundice decreases morbidity, the debate focuses on whether to perform a gastroenteric bypass. It may be done prophylactically at the initial diagnostic laparotomy or when symptoms of gastric outlet obstruction have arisen. The

choice between these options is mainly determined by the incidence of symptoms of gastric outlet obstruction during the course of the disease. In a review of the literature we found an incidence of obstruction ranging from 3% to 50% [4, 8, 10–13]. Sarr and Cameron reviewed 3327 patients and found an incidence of 16% [9]. In our study, 25% of the patients developed symptoms of gastric outlet obstruction. Most authors state, therefore, that a prophylactic gastroenterostomy is obligatory [8, 9, 14]. We agree that if these symptoms could be prevented by adding a gastroenterostomy to a diagnostic laparotomy or a surgical biliary bypass procedure without any increase in morbidity or mortality it would be rational to do so. However, adding a gastroenterostomy to a laparotomy or a surgical biliodigestive bypass most likely increases morbidity and mortality [15–21]. Most patients do not develop symptoms of gastric outlet obstruction and therefore should not be operated on.

Few authors have reported on the frequency of gastric outlet obstruction after a prophylactic gastroenterostomy has been performed [22]. In our study, the incidence of gastric outlet obstruction after prophylactic gastroenterostomy was not significantly lower in comparison to the frequency of obstruction in patients who did not receive gastroenterostomy. Postoperative morbidity was higher in patients who underwent gastroenterostomy, regardless of whether it was combined with surgical biliodigestive bypass.

Delayed gastric emptying after gastroenterostomy is thought to be the main cause of postoperative morbidity. Doberneck and Berndt defined delayed gastric emptying as the inability to tolerate oral fluids for 8 days or more after operation [23]. They found delayed gastric emptying in 16% after prophylactic gastroenterostomy and in 57% after gastroenterostomy performed for symptomatic reasons. Other authors reported percentages of delayed gastric emptying after bypass surgery of the duodenum ranging from 14% to 29% [12, 14, 19]. We found delayed gastric emptying in 16% of the patients after a prophylactic gastroenterostomy and in 29% after a gastroenterostomy performed for symptomatic reasons. There was no difference in the number of days in which gastric suction was needed postoperatively between these patients. The exact pathophysiologic mechanism of gastric outlet obstruction is uncertain. The main reason is obviously the impingement on the duodenum by tumor growth. A bypass of the duodenum should solve this anatomic obstruction. However, not all patients are cured by gastroenterostomy, implying that other mechanisms must be involved, such as infiltration of the splanchnic nerves by tumor cells with subsequent functional impairment of gastric motility.

Our results indicate that prophylactic gastroenterostomy does not prevent future gastric outlet obstruction and furthermore increases morbidity; therefore, it should not be performed. A gastroenterostomy performed for symptomatic reasons should be considered carefully because the success rate is low and it is accompanied by a considerable incidence of morbidity and mortality. It is our opinion that palliative surgery in patients with advanced cancer of the head of the pancreas should be prevented at the extreme, as the postoperative problems are unacceptably high, especially considering that these patients have only a few months to live. Finally, it is necessary to learn more about the anatomic or functional rationale of gastric outlet obstruction in cancer of the head of

the pancreas in order to improve the alleviation of these symptoms.

### Résumé

Réaliser une gastroentérostomie de façon prophylactique ou seulement lorsque l'alimentation devient impossible chez un patient ayant un cancer de la tête du pancréas reste une question sans réponse. Les dossiers de 142 patients ayant un cancer avancé de la tête du pancréas, observés à l'Hôpital Universitaire Erasmus en l'espace de 11 ans, ont été revus. Nous avons noté la possibilité d'alimentation en périodes pré- et postopératoire ainsi que la morbidité et mortalité en rapport avec la chirurgie chez ces patients. Des 129 patients n'ayant pas de symptômes d'obstruction postpylorique au moment du diagnostic, 31 ont eu une gastroentérostomie à titre prophylactique. Cette intervention n'a pu prévenir l'obstruction chez 4 de ces patients. Des 98 autres patients, 15 ont développé une obstruction postpylorique. Une analyse multifactorielle selon le modèle de Cox n'a pu démontrer de différence significative entre les deux groupes pour l'intervalle entre le moment du diagnostic et la survenue de l'obstruction. Le taux de complications et de décès postopératoires après gastroentérostomie était élevée, variant respectivement entre 9% et 41% et 11% et 33%. Nos résultats indiquent que la gastroentérostomie à titre prophylactique ne prévient pas la survenue d'une obstruction postpylorique mais qu'elle accroît la morbidité. Dans ces conditions, la gastroentérostomie ne devrait être réalisée qu'en cas d'obstruction symptomatique, mais en sachant qu'elle n'est pas toujours couronnée de succès et que les taux de mortalité et de morbidité ne sont pas nuls.

### Resumen

Persiste la duda sobre la necesidad de practicar gastroenterostomía en pacientes con cáncer avanzado de la cabeza del páncreas, así sea profiláctica o en presencia de obstrucción al paso de los alimentos. Se revisaron las historias de 142 pacientes con cáncer avanzado de la cabeza del páncreas en el Hospital de la Universidad de Erasmo observados en un periodo de 11 años. El estudio se concentró especialmente sobre la ingesta pre y postoperatoria de alimentos en los pacientes con gastroenterostomía y en la morbilidad y mortalidad asociada con la cirugía abdominal. De 129 pacientes libres de síntomas de obstrucción en el momento del diagnóstico, 31 fueron sometidos a gastroenterostomía profiláctica; el procedimiento no logró prevenir la obstrucción gástrica en 4 casos. De los 98 pacientes restantes, 15 desarrollaron obstrucción gástrica. El análisis proporcional de Cox no demostró diferencia significativa en el intervalo transcurrido hasta la aparición de los síntomas entre los dos grupos, tomando en consideración diversas variables. Las tasas de complicaciones y de mortalidad postoperatoria en relación con la gastroenterostomía fueron elevadas, 9–41% y 11–33%, respectivamente. Nuestros resultados no indican que la gastroenterostomía profiláctica pueda prevenir la obstrucción gástrica y, por cuanto incrementa la morbilidad, no debe ser realizada. La gastroenterostomía por razones de sintomatología debe ser cuidadosamente considerada, puesto que la tasa de éxito es baja y se acompaña de considerable morbilidad y mortalidad.

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## Invited Commentary

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Mechanical duodenal obstruction is a well known complication of pancreatic carcinoma in its late stages. *Reoperation* for mechanical duodenal obstruction after palliative biliary bypass alone becomes necessary in as many as 16% of patients [1]; the percentage of other patients who die secondary to mechanical duodenal obstruction is unknown. Thus the question of whether a "prophylactic" gastroenterostomy should be performed in addition to a therapeutic biliary enteric bypass continues to be addressed. Antecolic gastroenterostomy prevents development of *mechanical* gastric outlet obstruction [2] from progression of the pancreatic mass to obstruct either the second portion of duodenum with pancreatic head lesions or the fourth portion with pancreatic body lesions. Functional, *nonmechanical* gastric outlet "obstruction" is a different and poorly understood problem that affects a number of unfortunate patients with pancreatic carcinoma as well.

The palliative management of unresectable pancreatic cancer has changed with the advent of nonoperative endoscopically placed biliary stents. Currently, many pancreatic surgeons favor endoscopic stents as the best palliation for patients with a

poor performance level or who are not expected to survive more than several months. In contrast, those patients expected to be at the upper end of the survival curve probably have as good or better quality of life after surgical internal biliary decompression. In the patients who would be expected to live longer, the question becomes: In this *select* population, is prophylactic gastroenterostomy indicated? The answer remains unknown. I personally favor gastroenterostomy. I acknowledge that hospital discharge may be delayed several days in about 20% of patients, but complications such as stomal ulcer, hemorrhage, or later mechanical obstruction from stenosis are infrequent. Most importantly, gastroenterostomy prevents the need for reoperation for mechanical duodenal obstruction in about 16% of patients.

The article by van der Schelling and colleagues is important, especially when taken in context with their other recent article on the results of curative pancreatic resection [3]. Aside from the rather high morbidity and operative mortality, this article raises several questions not fully answered in their report. It would have been ideal to include the incidence of delayed gastric emptying in the patients not treated with a gastroenterostomy to place this specific complication in appropriate focus. Second, although their definition of gastric outlet obstruction is somewhat vague and does not discriminate between functional and mechanical obstruction, it is the first attempt to recognize the possibility of late functional obstruction in this group of patients.

The question of the benefit of gastroenterostomy in the current surgical palliation of pancreatic cancer remains unde-