

## REVIEW ARTICLE

## Distal pancreatectomy: en-bloc splenectomy vs spleen-preserving pancreatectomy

LAUREANO FERNÁNDEZ-CRUZ, DAVID ORDUÑA, GLEYDSON CESAR-BORGES  
& MIGUEL ANGEL LÓPEZ-BOADO

*Department of Surgery, Hospital Clinic i Provincial de Barcelona, Barcelona, Spain*

### Abstract

Distal pancreatectomy with en-bloc splenectomy has been considered the standard technique for management of benign and malignant pancreatic disorders. However, splenic preservation has recently been advocated. The aim of this study was to review the experiences of distal pancreatectomy using the open or the laparoscopic approach and to critically discuss the need to perform splenectomy. Original articles published in the English literature of peer-reviewed medical journals were selected for detailed analysis. In patients with malignant neoplasms in the body-tail of the pancreas, splenectomy has a negative influence on long-term survival after resection. The incidence of diabetes after spleen-preserving distal pancreatectomy for chronic pancreatitis is less than after en-bloc splenectomy. Spleen salvage eliminates the risk of overwhelming infections. Laparoscopic spleen-preserving distal pancreatectomy is feasible and safe. Laparoscopic spleen-preserving distal pancreatectomy may be preferable for the advantages of a minimally invasive approach.

**Key Words:** *Laparoscopic pancreatic resection, spleen-preserving pancreatectomy, splenectomy*

### Introduction

In general, distal pancreatectomy is performed en-bloc along with resection of the spleen. Most of the time, the en-bloc pancreatic-spleen resection is performed for technical reasons; it makes the operation short and easy but does not offer any special advantage for the patient. Overwhelming sepsis after distal pancreatectomy and splenectomy has been reported [1]. Kimura *et al.* [2], have described the technique of preserving both the splenic artery and vein. In addition, Warshaw [3] has described a technique of distal pancreatectomy in which splenic vessels are ligated both at the level of transection of the pancreas and again at the splenic hilum, leaving the spleen to survive on blood flow through the short gastric vessels. Others have described techniques whereby the pancreas is dissected off the splenic vessels completely [4].

The objective of the present study was to review the experiences of distal pancreatectomy using the open or the laparoscopic approach and to critically discuss the need to perform splenectomy.

### Open surgery

In the literature, in patients with left-sided chronic pancreatitis and pancreatic tumours located in the

body-tail of the pancreas the technique most frequently used was distal pancreatectomy with en-bloc resection that included the spleen. However, in recent years, spleen-preserving distal pancreatectomy has been used more frequently. Spleen salvage is preferable because it eliminates the rare but potentially fatal complications of overwhelming infection with encapsulated bacterial organisms [1].

Published data from two retrospective reviews comparing patients who had surgery mainly for trauma or pancreatitis, undergoing distal pancreatectomy with and without splenectomy, had shown no differences in complication rates between groups, concluding that splenectomy should not be a routine part of distal pancreatic resection [4,5]. On the other hand, Benoist *et al.* [6] analysed 40 patients undergoing distal pancreatectomy for indications other than chronic pancreatitis. Fifteen patients underwent distal pancreatectomy with spleen conservation and 25 had splenectomy. Pancreatic left resection with splenectomy turned out to have a lower morbidity rate, as pancreatic complications such as fistula or subphrenic abscess occurred more frequently in patients after spleen-conserving surgery. More recently, Shoup *et al.* [7] reported the series from the Memorial Sloan-Kettering Cancer Center including 211 patients

undergoing distal pancreatectomy. Splenectomy was performed in 79 patients (63%) and splenic preservation in 46 (37%). The most common histopathological conditions were neuroendocrine tumours ( $n=45$ ) and benign cystic tumours ( $n=44$ ). Perioperative complications occurred in 49% of patients after splenectomy and in 39% after splenic preservation. Perioperative infectious complications and severe complications were significantly higher in the splenectomy group (28% and 11%), compared with the splenic preservation group (9% and 2%). The length of hospital stay was 9 days post-splenectomy and 7 days post-splenic preservation.

What is the evidence for and against distal pancreatectomy with splenic preservation, in benign and malignant pancreatic disorders?

#### *Spleen preservation in patients with pancreatic adenocarcinoma*

There is no real consensus on the need to perform spleen preservation in the setting of a malignant neoplasm. In the large series of 235 distal pancreatectomies reported by Lillemoe *et al.* [8], only 49 patients (21%) underwent resection for adenocarcinoma of the pancreas. They always recommend an en-bloc distal pancreatectomy with splenectomy. Andrén-Sandberg *et al.* [9], also believe that splenectomy should be routinely performed because splenic artery preservation is hazardous for oncologic radicality when distal pancreatectomy is performed for cancer. However, this argument should not be used against preservation of the spleen. Involvement of the splenic vein, and the splenic artery distant from the coeliac axis, is frequently found, and does not preclude distal pancreatic resection for malignant tumours in the body-tail of the pancreas. Mobilization of the caudal surface of the body of the pancreas from the retroperitoneum is performed after division of the splenic artery close the coeliac trunk, followed by division of the splenic vein close to the junction to the mesenteric vein. It allows an extensive retroperitoneal lymph node dissection. The spleen may be preserved by maintaining the integrity of the short gastric vessels and the left gastro-epiploic vessels (Warshaw's technique). According to Balcom *et al.* [10], spleen-sparing distal pancreatectomy may also be preferable in the setting of a malignant neoplasm not directly involving the spleen because it is a putative mechanism for maintenance of immune surveillance. Also, for Sasson *et al.* [11], whenever possible, splenic conservation should be attempted in patients undergoing total or distal pancreatectomy for adenocarcinoma of the pancreas. Schwarz *et al.* [12] have studied the impact of splenectomy on hospital stay and survival after resection of pancreatic adenocarcinoma. In this analysis, splenectomy has no significant measurable impact on postoperative recovery, but has a negative influence on long-term survival independent of disease-related factors. The

Table I. Spleen-sparing distal pancreatectomy in patients with chronic pancreatitis: open approach

Author (year)	Pancreatic left resection: no.	Spleen-sparing: no. (%)
Rattner <i>et al.</i> [14] (1996)	20	4 (20)
Evans <i>et al.</i> [15] (1997)	13	4 (31)
Schoenberg <i>et al.</i> [16] (1999)	74	25 (34)
Govil <i>et al.</i> [17] (1999)	38	22 (58)
Sakorafas <i>et al.</i> [18] (2001)	38	9 (24)
Bauer <i>et al.</i> [19] (2002)	12	4 (33)
Fernández-Cruz <i>et al.</i> [20] (2002)	41	16 (39)
Hutchins <i>et al.</i> [21] (2002)	90	29 (32)

authors concluded that splenectomy should be avoided in the operative treatment of exocrine pancreatic cancer at any localization.

#### *Spleen preservation in patients with left-sided chronic pancreatitis*

The French surgeon Mallet-Guy [13] first described, in the 1940s, the technique of spleen-preserving pancreatic left resection for patients with chronic pancreatitis. Since that time, the reasons why spleen-preserving distal pancreatectomy was performed or not performed, are not clear in the literature [14–21] (Table I). In some reports, the incidence of splenic preservation was rather low at 20%, as reported by Rattner *et al.* [14], and 24% as reported by Sakorafas *et al.* [18]. In some other reports, including our series, the spleen was salvaged successfully in 31–57.9% of cases [15–17,19–21]. The main reason for performing pancreatic left resection with splenectomy is the finding of pancreatic tissue firmly and densely adherent to the splenic vessels. The en-bloc distal pancreatic-spleen resection is mostly performed for technical reasons, to make the operation short and easy, as compared with spleen-preserving distal pancreatectomy, a technically demanding and more time-consuming procedure. We believe that—even in cases of severe chronic pancreatitis followed by gross pancreatic calcification, marked oedema and fibrosis that also encase the splenic vessels—spleen-sparing distal pancreatectomy should be encouraged, applying the Warshaw's technique with preservation of the short gastric vessels. In other cases, the oedema resulting from chronic inflammation surrounding the splenic vessels may facilitate splenic vessel preservation and splenic conservation.

Splenic preservation—apart from preventing post-splenectomy sepsis—might also delay the onset of diabetes mellitus. In some series, independent of the volume of the gland resected, the incidence of diabetes mellitus was less after spleen-preserving distal pancreatectomy than after en-bloc distal pancreatectomy and splenectomy [17,21]. Nevertheless, the latter technique should be indicated in cases of splenic vein occlusion and gastric varices and in cases of

Table II. Distal pancreatectomy for cystic tumours in the body-tail of the pancreas: open approach

Author (year)	Number of patients	Distal pancreatectomy: no. (%)	
		Splenectomy	Spleen-preserving
Pyke <i>et al.</i> [25] (1992)	17	NS	NS
Talamini <i>et al.</i> [26] (1998)	19	14 (74)	5 (26)
Meyer <i>et al.</i> [28] (1999)	10	NS	NS
Le Borgne <i>et al.</i> [29] (1999)	186	NS	NS
Horvath <i>et al.</i> [31] (1999)	13	9 (70)	4 (30)
Shima <i>et al.</i> [30] (2000)	14	NS	NS
Sarr <i>et al.</i> [22] (2000)	59	NS	NS
Kalil <i>et al.</i> [32] (2002)	11	11 (100)	–
Balzano <i>et al.</i> [33] (2003)	21	11 (52)	10 (48)
Kiely <i>et al.</i> [27] (2003)	11	4 (36)	7 (64)
Sheehan <i>et al.</i> [34] (2003)	34	32 (94)	2 (6)

NS, not stated.

pseudocyst or necrosis of the pancreatic tail involving the splenic hilum.

#### *Spleen preservation in patients with cystic pancreatic tumours*

Serous cystadenoma and mucinous cystic neoplasms (CyNP) are rare tumours that are often diagnosed in middle-aged women. Most patients experience vague abdominal pain and symptoms seemingly related to the mass effect of the tumour. These neoplasms are usually located in the body or tail of the pancreas and with high frequency are either benign or premalignant lesions [22,23]. However, two recent series of mucinous cystic neoplasms describe invasive carcinoma in 36% [23] and 29% [24]. Enucleation or pancreatic resection have been advocated in open surgery to manage these tumours. Is enucleation an appropriate method? Pyke *et al.* [25] reported on eight enucleations of serous cystadenomas: postoperatively there were two deaths and four complications requiring reoperation (one case of pancreatitis, one pancreatic pseudocyst and two pancreatic fistulas). In the Johns Hopkins's series the incidence of pancreatic fistula after enucleation was reported to be 50%, leading to a lengthy hospital stay (19.5 days) [26]. Recently, Kiely *et al.* [27] have introduced some major operative modifications, the introduction of intraoperative ultrasound imaging to identify the pancreatic duct and closure of the pancreatic defect after enucleation. In this series, despite these refinements in the technique, the pancreatic fistula rate was 27%, and the hospital stay was 12.6 days. We believe that tumour enucleation appears to be a debatable procedure in patients with CyNP. Tumour enucleation does not address the malignant potential of these tumours and should be used (in selected cases) with caution to avoid inadequate tumour margins. In the literature, when the tumour was located in the body or tail of the pancreas, the technique most frequently used was distal pancreatectomy. In some series, it was not stated whether there was conservation of the spleen at the

time of distal pancreatectomy [22,25,28–30]. In some other series [26,31–34], distal pancreatectomy with splenectomy was the technique most frequently used, with the exception of Kiely's report [27] (Table II).

#### *Spleen preservation in patients with neuroendocrine tumours*

This group of patients is very heterogeneous and a critical analysis of the results in the literature is difficult and beyond the scope of this paper.

#### **Laparoscopic surgery**

Soper *et al.* [35] in 1994 were able to establish the safety and efficacy of laparoscopic distal pancreatectomy in an animal model, with no evidence of pancreatic leaks or fistulae. Later, in 1996, Cuschieri *et al.* [36] described the technique they used to perform laparoscopic distal 70–80% pancreatectomy with en-bloc splenectomy in a group of five patients with intractable pain due to chronic pancreatitis. The authors demonstrated that this operation can be performed laparoscopically within an acceptable operating time and without major complications. In addition, with this technique, all patients achieved sustained pain relief. Gagner *et al.* [37] in 1996 described laparoscopic spleen-preserving distal pancreatectomy preserving the splenic artery and vein in a series of patients with neuroendocrine tumours, cystic tumours and chronic pancreatitis. However, Vezakis *et al.* [38] demonstrated that laparoscopic spleen-preserving distal pancreatectomy can be also performed using the Warshaw's technique. We also encourage laparoscopic spleen-preserving pancreatectomy (Lap SPDP) to prevent the potential long- and short-term complications associated with splenectomy. The question is whether it should be performed with or without splenic vessel preservation (Warshaw's technique). Splenomegaly is a contraindication for Warshaw's method because the increased mass is insufficiently nourished by the short gastric vessels.



Figure 1. Laparoscopic spleen-preserving distal pancreatectomy with splenic vessel preservation.

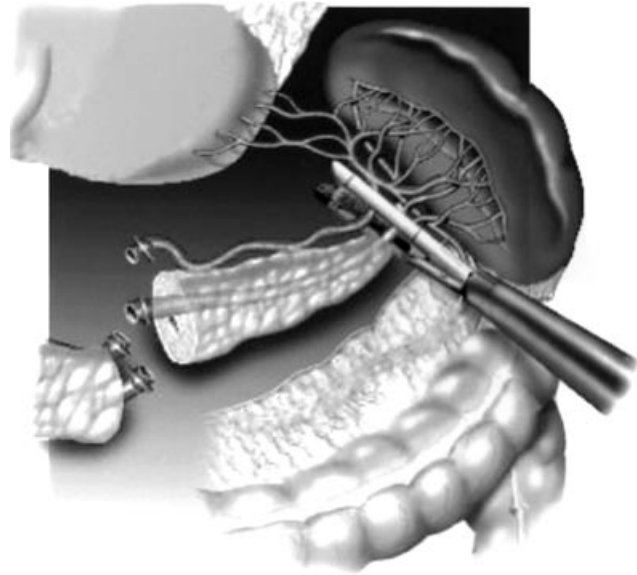


Figure 2. Laparoscopic spleen-preserving distal pancreatectomy without splenic vessel preservation. Care should be taken when transecting the splenic vessels at the splenic hilum to preserve the short gastric vessels and gastro-epiploic vessels.

There is no doubt that by preserving the splenic artery and vein, the blood supply to the spleen is well maintained and the danger of splenic necrosis and abscess formation is reduced. On the other hand, distal pancreatectomy with conservation of the splenic artery and vein is both time- and labour-consuming. Dissecting the splenic vessels from the pancreas may be difficult in the presence of tumours distorting and compressing the course of the vessels. Recently, we have reported a prospective study to evaluate the feasibility and outcome of Lap SPDP, with and without splenic vessel preservation [39] (Figures 1 and 2). Comparison of the groups demonstrated a statistically

significant difference in the parameters of operative time and intraoperative blood loss, in favour of division of the splenic vessels. In any case, as regards the question of whether or not to conserve the splenic vessels, we believe, in accordance with Warshaw [40] 'if the goal is to save the spleen, having options allows the surgeons to match the tactics to the terrain'.

In the literature, the indications for laparoscopic distal pancreatectomy are neuroendocrine tumours and benign-appearing tumours. In some series laparoscopic distal pancreatectomy (Lap DP) is performed in association with splenectomy [41–44] (Table III). However, in some other series Lap SPDP

Table III. Laparoscopic distal pancreatectomy for tumours in the body-tail of the pancreas

Author (year)	Number of patients	Distal pancreatectomy with splenectomy: no. (%)	Spleen-preserving distal pancreatectomy: no. (%)
Gagner <i>et al.</i> (1996) [37]	8*	2 (25)	5 (62)
Gagner <i>et al.</i> (1997) [45]	9*	2 (22)	6 (67)
Cuschieri <i>et al.</i> (1998) [41]	9	9 (100)	–
Vezakis <i>et al.</i> (1999) [38]	6	1 (17)	5 (83)
Burpee <i>et al.</i> (1999) [46]	10	2 (20)	8 (80)
Azagra <i>et al.</i> (2000) [42]	10	10 (100)	–
Patterson <i>et al.</i> (2001) [47]	15	12 (80)	3 (20)
Barlehner <i>et al.</i> (2001) [43]	5	5 (100)	–
Park <i>et al.</i> (2002) [48]	23	11 (48)	12 (52)
Fabre <i>et al.</i> (2002) [49]	13	3 (23)	10 (77)
Gramatica <i>et al.</i> (2002) [50]	5	1 (20)	4 (80)
Mabrut <i>et al.</i> (2002) [51]	11	5 (45)	6 (55)
Masson <i>et al.</i> (2003) [52]	7	–	7 (100)
Nieuwenhove <i>et al.</i> (2003) [52]	5	2 (40)	3 (60)
Edwin <i>et al.</i> (2004) [44]	17	12 (71)	5 (29)
Shimizu <i>et al.</i> (2004) [54]	9	–	9 (100)
Fernández-Cruz <i>et al.</i> (2004) [55]	40	3 (7)	37 (93)

\* Negative exploration in one patient.

with or without splenic vessel preservation was the most preferable technique [37,38,41–55] (Table III). In our series of 40 patients spleen salvage was possible in 92% [55]. However, after Lap SPDP splenic complications were observed in 16.6% of patients, and interestingly this complication was only observed in patients undergoing Warshaw's technique. This complication may be suspected clinically with the presence of fever and left upper abdominal pain. Colour Doppler ultrasonography will show the area of splenic infarct. Abscess formation can be prevented by administration of antibiotics. A more serious complication is massive necrosis of the organ with local infection that requires splenectomy, as occurred in one of our patients. Nevertheless, Warshaw's technique is faster and less technically demanding than splenic vessel preservation.

## Conclusions

Splenectomy should not be a routine part of distal pancreatic resection. Lessons learnt from patients with malignant neoplasms in the body-tail of the pancreas suggest that splenectomy has a negative influence on long-term survival after resection. Also, in patients undergoing distal pancreatic resection for chronic pancreatitis, independent of the volume of the gland resected, the incidence of diabetes mellitus was less after spleen preservation than after en-bloc splenectomy. In addition, spleen salvage should be preferable because it eliminates the rare but potentially fatal complications of overwhelming infection with encapsulated bacterial organisms.

At present, there are no data comparing the open and the laparoscopic approach in patients undergoing distal pancreatic resection for benign-appearing pancreatic disorders. However, laparoscopic spleen-preserving distal pancreatectomy may be preferable for the advantages of a minimally invasive approach: reducing the parietal damage to the abdomen, acceptable complications rate, reasonably short hospital stay and early return of the patients to previous activities.

## References

- [1] Holdsworth RJ, Irving AD, Cuschieri A. Postsplenectomy sepsis and its mortality rate: actual versus perceived. *Br J Surg* 1991;78:1031–8.
- [2] Kimura W, Inoue T, Futakawa N, Shinkai H, Muto T. Spleen-preserving distal pancreatectomy with conservation of the splenic artery and vein. *Surgery* 1996;120:885–90.
- [3] Warshaw AL. Conservation of the spleen with distal pancreatectomy. *Arch Surg* 1988;123:550–3.
- [4] Aldridge MC, Williamson RCN. Distal pancreatectomy with and without splenectomy. *Br J Surg* 1991;78:976–9.
- [5] Richardson DQ, Scott-Conner CEH. Distal pancreatectomy with and without splenectomy. *Am Surg* 1989;55:21–5.
- [6] Benoist S, Dugue L, Sauvanet A, Valverde A, Mauvais F, Paye F, et al. Is there role of preservation of the spleen in distal pancreatectomy? *J Am Coll Surg* 1999;188:255–60.
- [7] Shoup M, Brennan MF, McWhite K, Leung DH, Klimstra D, Conlon KC. The value of splenic preservation with distal pancreatectomy. *Arch Surg* 2002;137:164–8.
- [8] Lillemoie KD, Kaushal S, Cameron JL, Sohn TA, Pitt HA, Yeo CJ. Distal pancreatectomy: indications and outcomes in 235 patients. *Ann Surg* 1999;229:693–8.
- [9] Andren-Sandberg A, Wagner M, Tihanyi T, Lofgren P, Fries H. Technical aspects of left-sided pancreatic resection for cancer. *Dig Surg* 1999;16:305–12.
- [10] Balcom JH 4th, Rattner DW, Warshaw AL, Chang Y, Fernández-del Castillo C. Ten-years experience with 733 pancreatic resections: changing indications, older patients, and decreasing length of hospitalization. *Arch Surg* 2001;136:391–8.
- [11] Sasson AR, Hoffman JP, Ross EA, Kagan SA, Pingpank JF, Eisenberg BL. En bloc resection for locally advanced cancer of the pancreas: is it worthwhile? *J Gastrointest Surg* 2002;6:147–57.
- [12] Schwarz RE, Harrison LE, Conlon KC, Klimstra DS, Brennan MF. The impact of splenectomy on outcomes after resection of pancreatic adenocarcinoma. *J Am Coll Surg* 1999;188:516–21.
- [13] Mallet-Guy P, Vachon A. *Pancreatites chroniques gauches*. Paris: Masson: 1943.
- [14] Rattner DW, Fernandez-del Castillo C, Warshaw AL. Pitfalls of distal pancreatectomy for relief of pain in chronic pancreatitis. *Am J Surg* 1996;171:142–5.
- [15] Evans JD, Morton DG, Neoptolemos JP. Chronic pancreatitis and pancreatic carcinoma. *Postgrad Med J* 1997;73:543–8.
- [16] Schoenberg MH, Schlosser W, Ruck W, Beger HG. Distal pancreatectomy in chronic pancreatitis. *Dig Surg* 1999;16:130–6.
- [17] Govil S, Imrie CW. Value of splenic preservation during distal pancreatectomy for chronic pancreatitis. *Br J Surg* 1999;86:895–8.
- [18] Sakorafas GH, Sarr MG, Rowland CM, Farnell MB. Post-obstructive chronic pancreatitis: results with distal resection. *Arch Surg* 2001;136:643–8.
- [19] Bauer A, Uhl W, Tcholakov O, Wagner M, Friess H, Büchler MW. Pancreatic left resection in chronic pancreatitis – indications and limitations. In: Büchler MW, Friess H, Uhl W, Malfertheiner P, eds. *Chronic pancreatitis – novel concepts in biology and therapy*. UK: Blackwell, 2002: 529–39.
- [20] Fernandez-Cruz L, Saenz A, Astudillo E, Pantoja JP, Uzcategui E, Navarro S. Laparoscopic pancreatic surgery in patients with chronic pancreatitis. *Surg Endosc* 2002;16:996–03.
- [21] Hutchins RR, Hart RS, Pacifico M, Bradley NJ, Williamson RC. Long-term results of distal pancreatectomy for chronic pancreatitis in 90 patients. *Ann Surg* 2002;236:612–18.
- [22] Sarr MG, Carpenter HA, Prabhakar LP, Orchard TF, Hughes S, van Heerden JA, et al. Clinical and pathologic correlation of 84 mucinous cystic neoplasms of the pancreas: can one reliably differentiate benign from malignant (or premalignant) neoplasms? *Ann Surg* 2000;231:205–12.
- [23] Thompson LDR, Becker RC, Prygodzki RM, Adair CF, Heffess CS. Mucinous cystic neoplasm (mucinous cystadenocarcinoma of low grade malignant potential) of the pancreas. *Am J Surg Pathol* 1999;23:1–6.
- [24] Zamboni G, Scarpa A, Bogina G, Iacona C, Bassi C, Talamini G, et al. Mucinous cystic tumors of the pancreas. *Am J Surg Pathol* 1999;23:410–22.
- [25] Pyke CM, van Heerden JA, Colby TV, Sarr MG, Weaver AL. The spectrum of serous cystadenoma of the pancreas. Clinical, pathologic, and surgical aspects. *Ann Surg* 1992;215:132–9.
- [26] Talamini MA, Moesinger R, Yeo CJ, Poulouse B, Hruban RH, Cameron JL, et al. Cystadenomas of the pancreas: is enucleation an adequate operation? *Ann Surg* 1998;227:896–903.
- [27] Kiely JM, Nakeeb A, Komorowski RA, Wilson SD, Pitt HA. Cystic pancreatic neoplasms: enucleate or resect? *J Gastrointest Surg* 2003;7:890–7.

- [28] Meyer W, Kohler J, Gebhardt C. Cystic neoplasms of the pancreas – cystadenomas and cystadenocarcinomas. *Langenbecks Arch Surg* 1999;384:44–9.
- [29] Le Borgne J, de Calan L, Partensky C. Cystadenomas and cystadenocarcinomas of the pancreas: a multiinstitutional retrospective study of 398 cases. *French Surgical Association. Ann Surg* 1999;230:152–61.
- [30] Shima Y, Mori M, Takakura N, Kimura T, Yagi T, Tanaka N. Diagnosis and management of cystic pancreatic tumours with mucin production. *Br J Surg* 2000;87:1041–7.
- [31] Horvath KD, Chabot JA. An aggressive resectional approach to cystic neoplasms of the pancreas. *Am J Surg* 1999;178:269–74.
- [32] Kalil AN, Lichtenfels E, Fornari A, Rhoden E, Giovenardi R. Management of cystic neoplasms of the pancreas. *Hepato-gastroenterology* 2002;49:1432–5.
- [33] Balzano G, Zerbi A, Veronesi P, Cristallo M, Di Carlo V. Surgical treatment of benign and borderline neoplasms of the pancreatic body. *Dig Surg* 2003;20:506–10.
- [34] Sheehan MK, Beck K, Pickleman J, Aranha GV. Spectrum of cystic neoplasms of the pancreas and their surgical management. *Arch Surg* 2003;138:657–60.
- [35] Soper NJ, Brunt LM, Dunnegan DL, Meininger TA. Laparoscopic distal pancreatectomy in the porcine model. *Surg Endosc* 1994;8:57–60.
- [36] Cuschieri A, Jakimowicz JJ, van Spreuwel J. Laparoscopic distal 70% pancreatectomy and splenectomy for chronic pancreatitis. *Ann Surg* 1996;223:280–5.
- [37] Gagner M, Pomp A, Herrera MF. Early experience with laparoscopic resections of islet cell tumors. *Surgery* 1996;120:1051–4.
- [38] Vezakis A, Davides D, Larvin M, McMahon MJ. Laparoscopic surgery combined with preservation of the spleen for distal pancreatic tumors. *Surg Endosc* 1999;13:26–9.
- [39] Fernández-Cruz L, Martínez I, Gilabert R, Cesar-Borges G, Astudillo E, Navarro S. Laparoscopic distal pancreatectomy combined with preservation of the spleen for cystic neoplasms of the pancreas. *J Gastrointest Surg* 2004;8:493–501.
- [40] Warshaw A. Techniques of preserving the spleen with distal pancreatectomy. *Surgery* 1997;121:974.
- [41] Cuschieri A, Jakimowicz JJ. Laparoscopic pancreatic resections. *Semin Laparosc Surg* 1998;5:168–79.
- [42] Azagra JS, Goergen M, Gilbart E, De Simone P, Ceuterick M, Ibanez-Aguirre J. Coelio-splénopancreatectomie corporéocaudale: technique opératoire. *Le Journal de Coelochirurgie* 2000;36:22–7.
- [43] Barlechner E, Anders S, Schwetling R. Laparoscopic resection of the left pancreas: technique and indication. *Dig Surg* 2002;19:507–10.
- [44] Edwin B, Mala T, Mathisen O, Gladhaug I, Buanes T, Lunde OC, et al. Laparoscopic resection of the pancreas: a feasibility study of the short-term outcome. *Surg Endosc* 2004;18:407–11.
- [45] Gagner M, Pomp A. Laparoscopic pancreatic resection: is it worthwhile? *J Gastrointest Surg* 1997;1:20–6.
- [46] Burpee ST, Jossart G, Gagner M. The laparoscopic approach to gastroenteropancreatic tumors. *Acta Chir Austriaca* 1999;31:207–13.
- [47] Patterson EJ, Gagner M, Salky B, Inabnet WB, Brower S, Edey M, et al. Laparoscopic pancreatic resection: single-institution experience of 19 patients. *J Am Coll Surg* 2001;193:281–7.
- [48] Park AE, Heniford BT. Therapeutic laparoscopy of the pancreas. *Ann Surg* 2002;236:149–58.
- [49] Fabre JM, Dulucq JL, Vacher C, Lemoine MC, Wintringer P, Nocca D, et al. Is laparoscopic left pancreatic resection justified? *Surg Endosc* 2002;16:1358–61.
- [50] Gramatica L Jr, Herrera MF, Mercado-Luna A, Sierra M, Verasay G, Brunner N. Videolaparoscopic resection of insulinomas: experience in two institutions. *World J Surg* 2002;26:1297–300.
- [51] Marbrut JY, Boulez J, Peix JL, Gigot JF, Gouillat C, De La Roche É, et al. Laparoscopic pancreatic resections. *Ann Chir* 2003;128:425–6 [in French].
- [52] Masson B, Sa-Cunha A, Laurent C, Rault A, Collet D. Laparoscopic pancreatectomy: report of 22 cases. *Ann Chir* 2003;128:452–56 [in French].
- [53] Van Nieuwenhove Y, Vandaele S, Op de Beeck B, Delvaux G. Neuroendocrine tumors of the pancreas. *Surg Endosc* 2003;17:1658–62.
- [54] Shimizu S, Tanaka M, Konomi H, Mizumoto K, Yamaguchi K. Laparoscopic pancreatic surgery: current indications and surgical results. *Surg Endosc* 2004;18:402–6.
- [55] Fernández-Cruz L, Cesar-Borges G, Orduña D, López-Boado MA. Laparoscopic distal pancreatectomy: a plea for spleen-preservation. *Surg Endosc* (In press).