Spleen-preserving Distal Pancreatectomy without Division of Splenic Artery and Vein as a Procedure for Benign Distal Pancreatic Lesion

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Background: To assess the safety and the clinical outcome of distal pancreatectomy, with preservation of the spleen as well as splenic artery and vein, for benign distal pancreatic lesions.

Methods: Five consecutive patients with benign distal pancreatic lesions (3 with insulinoma, 1 with non-functioning islet cell tumor and 1 with serous cystadenoma) underwent spleen-preserving distal pancreatectomy with conservation of the splenic artery and vein. Prograde distal pancreatectomy was performed for 4 patients and retrograde pancreatectomy for the other. The operative time, blood loss due to surgery, length of post-operative hospitalization and post-operative complications were analyzed and evaluated.

Results: Surgery was successful for all 5 patients. Whilst 2 of the patients revealed major medical disease, no post-surgical complications were experienced by any of the 5 patients. The mean operative time, extent of blood loss, and postoperative hospital stay were, respectively, 238 minutes (range 175 - 270), 170 ml (range 50 - 300), and 8.4 days (range 6 - 15).

Conclusion: From our experience, spleen-preserving distal pancreatectomy can be safely performed with the conservation of the splenic artery and vein. Our result revealed that this well-known procedure can be improved in terms of blood loss, surgical duration and length of hospital stay. We believe that this procedure should be performed for benign lesions of the distal pancreas whenever indicated and possible.

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Key words: distal pancreatectomy.

Surgical splenectomy is usually considered to be a routine part of distal pancreatectomy due to the intimate relationship of the splenic artery and vein with the pancreatic body and tail. The technique is relatively simple, and the operation can be completed quite rapidly.[1-3] The spleen plays an important role in the host immune defense system, however, and patients who undergo splenectomy experience the increased risk of potentially-overwhelming post-splenectomy sepsis.[4] It thus appears quite logical that the spleen should be saved whenever it can be without substantial complication.

On the other hand, dissection of the splenic vessels from the pancreas is not widely performed

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because it is thought to be time-consuming and it is prone to elicit an increased degree of blood loss as well as demonstrating an increased risk of pancreatitis.

In short, there is still no definite confirmation as to whether the preservation of the spleen when conducting distal pancreatectomy is worthwhile or not.[5-7] Subsequent to gaining some experience with the surgical procedure, we herein report our results and also a summary of the technique of spleen-preserving distal pancreatectomy.

METHODS

Between 1997 and 1999, 5 patients (3 men and 2 women) with an average age of 46.4 years (range 17-69), exhibiting benign lesions of the distal pancreas were approached for inclusion in this study.

For these subjects, an endocrine study, abdominal computed tomography (CT), magnetic resonance image (MRI), and visceral angiography were conducted as part of their pre-operative evaluation. The pre-operative diagnosis was insulinoma for 3 patients, and a non-functioning islet cell tumor and a serous cystadenoma for the other 2 patients (Table 1).

The patient with the non-functioning islet cell tumor also demonstrated diabetes mellitus (DM) and iatrogenic Cushing syndrome due to his long-term steroid intake following a bilateral total hip replacement 10 years ago. The patient with the serous cystadenoma revealed a medical history of hypertension, sick sinus syndrome and multiple nodular goiter of the thyroid. The remaining 3 patients presented with no previous medical history.

All the patients underwent distal pancreatectomy with spleen preservation. It was our intention, that the splenic artery and vein was to be preserved under all circumstances.

Technique

The abdomen was opened either by a left subcostal incision or a midline incision, the gastrocolic ligament being divided through a relatively avascular zone as much as was possible, in order to facilitate full visualization of the entire pancreas, and the splenic flexure of the colon was deflected downwards and pushed caudally. Intra-operative sonography was performed at this stage to identify the location, size, and nature of the lesion. The distance of the lesion from the splenic vein or any possible communication between the lesion and the main pancreatic duct was also able to be checked in this way.

The next step was to mobilize the pancreas from a retro-peritoneal aspect. At this stage, we typically did not divide the spleno-renal ligament, leaving the spleen in situ, thus the splenic vein was straight and those tributaries extending to the pancreas could be more easily identified. The peritoneum was incised along the lower and upper margin of the pancreas and then a surgical plane was established posterior to the pancreas. The splenic vein could be identified at this stage, it being covered by a thin membrane, and located at the back of the pancreas. From our experience, we prefer a prograde dissection starting from the splenic hilum provided that the lesion was not located too close to the hilum (Fig. 1). This was the case for the patient with serous cystadenoma, the lesion consisting of multiple thin-walled cysts occupying the pancreatic body and tail, concern being raised that these cysts might be ruptured if prograde dissection was performed. Thus, we divided the pancreatic neck first and performed a retrograde dissection in this case because it seemed more practical and easier.

After the pancreatic body and tail leftside to the mesenteric vein was resected, the pancreatic stump was oversewn by use of an interrupt suture, and no pancreatico-jejunostomy was needed for any of our

Table 1. Data of the Five Patients Who Received Spleen-preserving Distal Pancreatectomy

Patient no.	Age/Gender	Diagnosis	Location	Size (cm)	Pathologic diagnosis
1	53/M	non-functioning tumor	body	2.5	islet cell tumor
2	17/F	insulinoma	body	1.9	insulinoma
3	53/M	insulinoma	tail	1.2	insulinoma
4	40/M	insulinma	tail	1.5	insulinoma
5	69/M	cystadenoma	body and tail	5	serous cystadenoma

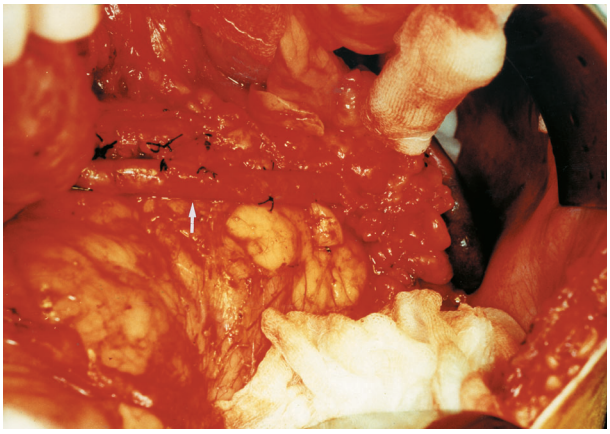

Fig. 1 The distal pancreas is retracted to the right side showing the well-preserved splenic artery and vein (arrow). The spleen is left in situ.

patients. Finally a Jackson-Parett drain was used as a closed drainage.

RESULTS

All the patients were successfully treated by distal pancreatectomy without splenectomy, and the splenic artery and vein were preserved for each patient. The 3 patients with insulinoma and the patient with benign non-functioning islet cell tumor all demonstrated a solitary tumor, with no associated metastasis apparent, although the patient exhibiting a serous cystadenoma revealed multiple cystic lesions, the largest of which measured five centimeters in diameter. The average tumor size for all 5 patients being 2.4 cm (range 1.2 to 5). The patient presenting with a serous cystadenoma was also found to be suffering from an associated chronic pancreatitis, this making dissection more difficult than that experienced for the other 4 patients, although, no major bleeding during surgery occurred for any of the patients.

The mean ¡ standard deviation of surgical duration, blood loss, and post-operative hospital stay were, respectively, 238 ¡ 36.8 minutes, 170 ¡ 104 ml, and 8.4 ¡ 3.8 days, there being neither operative mortality nor complication. No operative fistula, subphrenic abscess, pancreatitis or minor complication such as wound infection was encountered, the drain tube being removed when the output was less then 20 ml/day.

The only patient who stayed in hospital for more then 2 weeks post-operatively was the 69 year-old individual who was suffering from a serous cystadenoma with multiple medical conditions. This patient complained of generalized weakness and fatigue, resulting in prolonged hospitalization even though no apparent complication was noted 1 week subsequent to surgery. The general condition of this patient improved gradually subsequent to surgery, she being discharged on the 15th day post-operatively (Table 2). The post-operative follow-up for at least one year was uneventful for all the patients.

DISCUSSION

Many authors have reported their experience about infectious problems after splenectomy, some of them considering such infection as a significant problem,[4] although others regard the associated potential morbidity as being of a very low incidence.[8,9] However, we emphasize our earlier suggestion that when the spleen can be safely preserved, there appears to be no reason to perform splenectomy and take risks of post-splenectomy infection. This being the principal reason for which we perform

Table 2. Operative Time, Direction of Dissection, Blood Loss, Complication and Length of Postoperative Stay in Patients with Spleen Preserving Distal Pancreatectomy

Patient no.	Operative time	Direction	Blood loss	Complication	Postoperative stay
1	250 min	prograde	150 ml	none	8 days
2	240 min	prograde	50 ml	none	6 days
3	255 min	prograde	100 ml	none	6 days
4	175 min	prograde	250 ml	none	7 days
5	270 min	retrograde	300 ml	none	15 days

spleen-preserving distal pancreatectomy whenever possible.

Management of benign distal pancreatic lesion consists mainly of enucleation or distal pancreatectomy, both of which are equally effective and carries low complication rate. Phan, et al.[10] performed more distal pancreatectomies than enucleation, however, Huai, et al. did the opposite.[11] For it is our objective to evaluate the feasibility of vessel-conserved spleen-preserving distal pancreatectomy, all of our patients underwent the procedure.

It has been previously reported that the spleen can be successfully preserved even after division of the splenic artery,[12,13] since the remaining short gastric and left gastro-epiploic vessels can afford adequate blood supply to the spleen. Warshaw[13] noted that this procedure is relatively simple and that the spleen may typically be preserved without substantial complication. However, he also mentioned that there was one splenic necrosis in his series which occurred in a patient with splenomegaly. The reason might be that the blood supply from remaining short gastric and gastroepiploic vessels was inadequate to nourish the increased tissue mass. As there were no guidelines of how large a spleen would be contraindicated to sacrifice splenic artery, our vessel-conserving procedure could be able to avoid such uncertainty and still keep the operative time in a reasonable range.

At least 2 dissection techniques have been described for this kind of surgery: prograde and retrograde distal pancreatectomy.[7,14,15] Retrograde distal pancreatectomy requires early development of a window between the pancreas and the splenic vein or superior mesenteric vein whilst the greater part of the pancreatic body and tail is still firmly attached to the splenic vein. The space created for dividing the pancreas is usually small and, in our opinion, it is difficult to control bleeding if inadvertent vascular injury occurs at this time, especially when the pancreas is chronically inflamed or fibrotic. Contrasting this experience, prograde distal pancreatectomy necessitates the mobilization of the pancreatic body and tail prior to resection. Hence, utilizing this surgical technique, it is possible to inspect and palpate the lesion to the surgeon's satisfaction prior to resection, and the line of resection can be precisely determined with direct visualization. Based upon our experience, we would usually attempt prograde distal pancreatectomy in the first instance, unless it appeared to be difficult to commence dissection from the region of the splenic hilum.

Benoist, et al. found that the likelihood of post-operative complication, especially pancreatic fistula, is more frequently seen for patients underwent spleen-preserving procedure than for those experiencing splenectomy, and that there is no increased risk of post-splenectomy infection in the latter group.[5] These authors considering distal pancreatectomy with splenectomy to be the best surgical procedure for dealing with benign disease of distal pancreas. Our experience, however, reveals that the above-described spleen-preserving procedure can be performed without any complication which is supported by a similar result reported by Richardson, et al.[6] who noted that no complication was observed for five patients who underwent the same procedure as our patients did. From our project, the mean ¡ SD of surgical duration, blood loss and post-operative hospital stay was 238 +36.8 minutes, 170 ¡ 104 ml, and 8.4+3.8 days respectively which appears to be more acceptable than the results reported by Kimura, et al. whose group performing the same procedure.[16] Their corresponding data being 290 ¡ 49 minutes of surgical time, 600 ¡ 479 ml of blood loss, and 40 ¡ 21 days of post-operative hospital stay. Our results would also appear to be at least as good as those reported by Richardson, et al.[6] in 1989 and Benoist et al. 10 years later.[5] In terms of surgical duration, blood loss and the length of hospital stay subsequent to surgery, it is not easy to fully explain our favorable results by comparison to those of others as reported above. We would advise, however, that intra-operative sonography should be used to determine the location of the lesion and the results thus be used to influence a decision regarding the optimal direction of dissection. Commencing from the more appropriate side, in our experience, may save some surgical time. Leaving the spleen in situ without division of the spleno-renal ligament is also a good way to ensure that the splenic vein remains straight whilst the pancreas is being retracted, facilitating more effective dissection.

In conclusion, we believe that with a meticulous technique directed to preserve both the splenic vein and artery, spleen-preserving distal pancreatectomy

can be safely conducted without any increase in surgical duration, hospital stay or complication rate even by a senior resident. Although it is a well-known procedure for benign pancreatic lesions, we have shown here that it still has some room for improvement. Either prograde or retrograde dissection may be used depending upon the individual situation. The spleen should be preserved, whenever possible, when performing surgery for benign diseases of the pancreatic body and tail.

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