

Technical innovations

Central pancreatectomy without anastomosis

Michael Wayne*, Siyamek Neragi-Miandoab, Franklin Kasmin,
William Brown, Anil Pahuja and Avram M Cooperman

Address: The Pancreas and Biliary Center at Saint Vincent's Hospital, Manhattan, 170 West 12th Street, Cronin 454, New York, NY 10011, USA

Email: Michael Wayne* - waynedocny@yahoo.com; Siyamek Neragi-Miandoab - sneragi@aol.com; Franklin Kasmin - fkasmin@svcmcnyc.org; William Brown - wbrown@svcmcnyc.org; Anil Pahuja - apahuja@svcmcnyc.org; Avram M Cooperman - avram.cooperman@gmail.com

* Corresponding author

Published: 31 August 2009

Received: 1 July 2009

World Journal of Surgical Oncology 2009, 7:67 doi:10.1186/1477-7819-7-67

Accepted: 31 August 2009

This article is available from: <http://www.wjso.com/content/7/1/67>

© 2009 Wayne et al; licensee BioMed Central Ltd.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/2.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Abstract

Background: Central pancreatectomy has a unique application for lesions in the neck of the pancreas. It preserves the distal pancreas and its endocrine functions. It also preserves the spleen.

Methods: This is a retrospective review of 10 patients who underwent central pancreatectomy without pancreatico-enteric anastomosis between October 2005 and May 2009. The surgical indications, operative outcomes, and pathologic findings were analyzed.

Results: All 10 lesions were in the neck of the pancreas and included: 2 branch intraductal papillary mucinous neoplasms (IPMNs), a mucinous cyst, a lymphoid cyst, 5 neuroendocrine tumors, and a clear cell adenoma.

Conclusion: Central pancreatectomy without pancreatico-enteric anastomosis for lesions in the neck and proximal pancreas is a safe and effective procedure. Morbidity is low because there is no anastomosis. Long term endocrine and exocrine function has been maintained.

Introduction

In 1957, Guillemin and Bessot [1] described central pancreatectomy (CP) in a patient with chronic pancreatitis. Central pancreatectomy (CP) has since been used in select cases for treating pancreatitis, most often for benign and low grade malignant lesions in the neck of the pancreas

[2-4]. Potential advantages of central pancreatectomy include preservation of endocrine, exocrine, and splenic function [3,5-7].

Benign or low-grade malignant lesions in the neck of the pancreas have been treated surgically, either by pancreti-

coduodenectomy resection (PDR) or distal pancreatectomy with splenectomy (DPS) or splenic preserving distal pancreatectomy (SPDP). Each operation involves a resection of a major portion of the pancreas, which in a diseased pancreas can worsen diabetes mellitus and/or exocrine insufficiency [8,9]. This paper will discuss the technique and benefits of a resection of the central portion of the pancreas; a simplification of the procedure, and a literature review of the topic.

Materials and methods

A review of patients who underwent CP between October 2005 and May 2009 at St. Vincent's Medical Center was done after approval by the Institutional Review Board. The mean age of patients was 54 ± 15 years and ranged from 34 to 77 years old. There were 5 male and 5 female patients in the study. Each patient in the study was asymptomatic and the lesions were discovered incidentally by CT scan, which was done for other reasons. Each patient was then evaluated by CT angiography and endoscopic studies, which included ERCP, EUS, biopsy, and cytology. (Table 1)

Technical aspects

Each operation was performed through an upper midline incision. The stomach is retracted downwards while the gastro-hepatic omentum is incised exposing the neck, body, and a portion of the tail of the pancreas. The gastrocolic omentum is dissected as needed. If necessary, the stomach can be retracted superiorly while the transverse

colon is retracted downwards and this facilitates exposure of the lower border of the pancreas and dissection of the superior mesenteric vein (SMV) behind the pancreas. Stay sutures are placed on either side of the lesion in the superior and inferior aspect of the pancreas. This facilitates dissection from the SMV and the stay sutures also help to control the transverse pancreatic vessels as well. Once the SMV is completely dissected from the pancreas, the distal margin of pancreas is transected, while protecting the SMV. The specimen is then excised by transecting the proximal margin. (Figure 1) The lesion is then sent to pathology to be evaluated for margins by frozen section, an example is seen in figure 2. The transected pancreas is oversewn after ligating both ends of the transected pancreatic duct. The pancreatic duct is suture ligated with a 4-0 vicryl suture and then the transected pancreas is oversewn with a running 4-0 prolene suture, imbricating the pancreatic capsule. A drain is placed and the abdomen is closed in standard fashion. The drains were removed upon discharge because there were no fistulas in our group.

Results

The resected lesions included a branch IPMN in 2 patients, a mucinous cyst, a lymphoid cyst, five neuroendocrine tumors, and a clear cell adenoma (Table 1). The mean operative time was 73.5 ± 10 minutes, and the estimated blood loss was 164 ± 89 ml. There were no mortalities in the study. The postoperative length of stay (LOS) was 5.9 ± 9.5 days (range 4 to 30); however, this was

Table 1: Patient summary

Patient	Gender	Age	Pathology	PMHx	Complications
1	M	77	IPMT	CAD, COPD	Pneumonia
2	F	68	IPMT	DM, HTN, obesity	Local wound infection
3	F	71	Mucinous cystic neoplasm	HTN	None
4	M	57	Lymphoid cystic neoplasm	COPD, obesity	Local wound infection
5	F	34	Neuroendocrine tumor	None	None
6	M	66	Neuroendocrine tumor	None	Local wound seroma
7	F	46	Clear cell adenoma	None	None
8	F	49	Neuroendocrine tumor	None	None
9	M	43	Neuroendocrine Tumor	Obesity	None
10	M	59	Neuroendocrine tumor	HTN	None

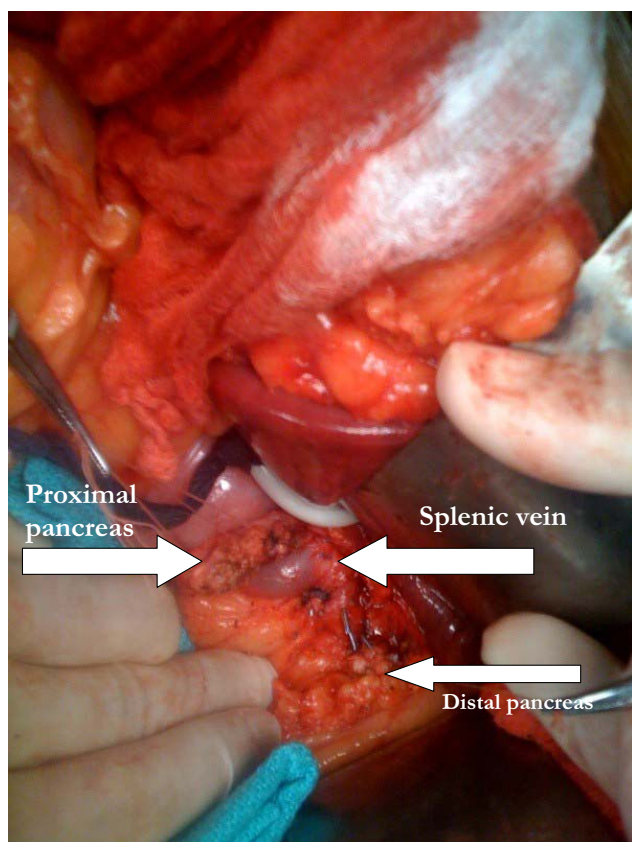


Figure 1
Operative site after removal of central portion of the pancreas.



Figure 2
Gross section of the tumor, diameter 2.8 cm.

skewed by one patient with COPD, who had pneumonia postoperatively and was hospitalized for 30 days. The LOS for the other patients in the study was 4.8 ± 0.75 days. Other postoperative complications included a superficial wound infection in 2 patients, and a wound seroma in one patient. These three patients were also obese.

Discussion

Central pancreatectomy has a unique application in certain patients with focal, chronic pancreatitis and trauma. It is utilized mostly for benign and low-grade malignant lesions in the neck of the pancreas [5,9-12]. The potential benefit of CP is to preserve pancreatic function and the spleen by limiting resection of normal parenchyma [2]. Diabetes mellitus (DM) occurs in 20% of patients following distal pancreatectomy [13-15]. Endocrine insufficiency is more frequent in patients with chronic pancreatitis and approaches 50% within 5 years after distal pancreatectomy (DP). Endocrine and exocrine insufficiency depends on residual function of the pancreas and the severity of pancreatitis [16]. The long-term risk of DM after pancreatic resection is greater after distal resection of the pancreas rather than after CP (11%, vs 50%) [8], particularly in an already diseased gland. The benefits of CP are obvious regarding pancreatic and splenic function [3,6,17]. Preservation of splenic function in the pediatric population may be important. Most CPs have utilized a pancreatico-jejunal or pancreatico-gastric anastomosis to the distal pancreas. The incidence of postoperative fistula in patients with a CP anastomosis ranges from 8% to 40% with a re-operative rate as high as 12% [2,9,18-20]. The incidence of a pancreatic leak after CP and pancreatic anastomosis is summarized in Table 2.

We suspect the relative frequency of a pancreatic fistula after CP is due to a small pancreatic duct and a normal soft distal gland. These two factors (a small duct and soft parenchyma) account for a higher fistula rate after pancreatico-duodenal resection (PDR). This is our reasoning for omitting a pancreatico-enteric anastomosis during CP. In our experience, the distal pancreatic tissue is usually normal and the duct is small in diameter. The indications for CP in chronic pancreatitis are few since focal pancreatitis confined to the neck of gland is unusual. CP may be technically more difficult because of chronic inflammation in these patients [2]. Furthermore, in patients with a pancreaticogastrostomy, fistula rates aside, exocrine function may not be preserved. Pancreatic enzymes, particularly lipase, are inactivated in an acidic environment [21-23]. Our series of 10 patients supports the value of resection without anastomosis in a short follow up period. To date, none of the patients in the study have developed any endocrine or exocrine deficiencies. So far, the morbidity of a pancreatic leak is removed while exocrine function is

Table 2: Postoperative Results; Literature Review

	N	Type of pancreatic anastomosis	Fistula rate (number and percentage)	Other Complications
Allendorf [8]	26	Pancreatico-gastrostomy	2/26 (7.7%)	None
Efron [9]	14	pancreaticogastrostomy	5/14 (36%)	
Roggin [6]	10	Central Pancreatectomy	3/10 (30%)	I
Christein, [2]	8	Roux-en-Y pancreaticojejunostomy	5/8 (63%)	25 re-operation for bleeding
Shimada [3]	10	Roux-en-Y pancreaticojejunostomy	5/10 (50%)	
Ocuin [4]	31	Central pancreatectomy (CP) n = 13 extended left pancreatectomy (ELP) n = 18	38% 17%	Exocrine/ Endocrine 10% 57% 27% 10%
Goldstein [10]	12	Roux-en-Y pancreaticogastrostomy	0/12, 0%	2/12 had endocrine insufficiency
Warshaw [12]	12	Roux-en-Y pancreaticojejunostomy	2/12,	One patient with gastric emptying
Sauvanet [20]	53	Roux-en-Y pancreaticojejunostomy	16/53, (30%)	40
Adham [19]	50	Roux-en-Y pancreaticojejunostomy	11/38, 22%	8% fistula (14% intra-abdominal collection) 6% bleeding
Fahy [24]	51	Distal pancreatectomy	11/51, (26%)	
Johnson [25]	8	Roux-en-Y pancreaticojejunostomy	0	No post-op endocrine insufficiency

preserved in the head and neck and endocrine function remains in both segments of pancreas when using central pancreatectomy without an anastomosis.

Conclusion

CP without an anastomosis may reduce the morbidity and length of hospital stay compared to patients undergoing CP with an anastomosis. It has been shown to be a safe, effective procedure which does not compromise pancreatic function.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

MW was the lead author and surgeon for all of the patients. SNM gathered information and contributed to writing of the paper. FK and WB were the GI doctors who contributed patients and information on the patients. AVC reviewed paper and technique of surgery. AC was the

co-surgeon on the cases. AP contributed to the literature review.

References

- Guillemin PBM: **Pancreatite chronique calcifiante chez un tuberculeux renal: pancreato-jejunostomie selon une technique originale.** *Mem Acad Chir Paris* 1957, **83**:869.
- Christein JD, Smoot RL, Farnell MB: **Central pancreatectomy: a technique for the resection of pancreatic neck lesions.** *Arch Surg* 2006, **141**:293.
- Shimada K, Sakamoto Y, Esaki M, Kosuge T, Hiraoka N: **Role of medial pancreatectomy in the management of intraductal papillary mucinous neoplasms and islet cell tumors of the pancreatic neck and body.** *Dig Surg* 2008, **25**:46.
- Ocuin LM, Sarmiento JM, Staley CA, Galloway JR, Johnson CD, Wood WC, Kooby DA: **Comparison of central and extended left pancreatectomy for lesions of the pancreatic neck.** *Ann Surg Oncol* 2008, **15**:2096.
- Christein JD, Kim AW, Golshan MA, Maxhimer J, Deziel DJ, Prinz RA: **Central pancreatectomy for the resection of benign or low malignant potential neoplasms.** *World J Surg* 2003, **27**:595.
- Roggin KK, Rudloff U, Blumgart LH, Brennan MF: **Central pancreatectomy revisited.** *J Gastrointest Surg* 2006, **10**:804.
- Celis Zapata J, Berrospi Espinoza F, Ruiz Figueroa E, Payet Meza E, Chavez Passiuri I, Young Tabusso F: **[Central pancreatectomy. Indications and perisurgical results of a pancreatic tissue conservation technique].** *Rev Gastroenterol Peru* 2005, **25**:349.

8. Allendorf JD, Schrope BA, Lauerman MH, Inabnet WB, Chabot JA: **Postoperative glycemic control after central pancreatectomy for mid-gland lesions.** *World J Surg* 2007, **31**:164.
9. Efron DT, Lillemoe KD, Cameron JL, Yeo CJ: **Central pancreatectomy with pancreaticogastrostomy for benign pancreatic pathology.** *J Gastrointest Surg* 2004, **8**:532.
10. Goldstein MJ, Toman J, Chabot JA: **Pancreaticogastrostomy: a novel application after central pancreatectomy.** *J Am Coll Surg* 2004, **198**:871.
11. Aranha GV: **Central (middle segment) pancreatectomy: a suitable operation for small lesions of the neck of the pancreas.** *Hepatogastroenterology* 2002, **49**:1713.
12. Warshaw AL, Rattner DW, Fernandez-del Castillo C, Z'Graggen K: **Middle segment pancreatectomy: a novel technique for conserving pancreatic tissue.** *Arch Surg* 1998, **133**:327.
13. Shibata S, Sato T, Andoh H, Yasui O, Yoshioka M, Kurokawa T, Watanabe G, Ise N, Kotanagi H, Asanuma Y, Koyama K: **Outcomes and indications of segmental pancreatectomy. Comparison with distal pancreatectomy.** *Dig Surg* 2004, **21**:48.
14. Slezak LA, Andersen DK: **Pancreatic resection: effects on glucose metabolism.** *World J Surg* 2001, **25**:452.
15. Jalleh RP, Williamson RC: **Pancreatic exocrine and endocrine function after operations for chronic pancreatitis.** *Ann Surg* 1992, **216**:656.
16. Martin RF, Rossi RL, Leslie KA: **Long-term results of pylorus-preserving pancreatoduodenectomy for chronic pancreatitis.** *Arch Surg* 1996, **131**:247.
17. Celis J, Berrospi F, Ruiz E, Payet E, Luque C: **Central pancreatectomy for tumors of the neck and body of the pancreas.** *J Surg Oncol* 2001, **77**:132.
18. Brown KM, Shoup M, Abodeely A, Hodul P, Brems JJ, Aranha GV: **Central pancreatectomy for benign pancreatic lesions.** *HPB (Oxford)* 2006, **8**:142.
19. Adham M, Giunipero A, Hervieu V, Courbière M, Partensky C: **Central pancreatectomy: single-center experience of 50 cases.** *Arch Surg* 2008, **143**:175.
20. Sauvanet A, Partensky C, Sastre B, Gigot JF, Fagniez PL, Tuech JJ, Millat B, Berdah S, Dousset B, Jaeck D, Le Treut YP, Letoublon C: **Medial pancreatectomy: a multi-institutional retrospective study of 53 patients by the French Pancreas Club.** *Surgery* 2002, **132**:836.
21. Laver P, Keller J: **Pancreatic enzymes: secretion and luminal nutrient digestion in health and disease.** *J Clin Gastroenterol* 1999, **28**:3.
22. Roberts IM: **Enzyme therapy for malabsorption in exocrine pancreatic insufficiency.** *Pancreas* 1989, **4**:496.
23. Dominguez-Munoz JE: **Pancreatic enzyme therapy for pancreatic exocrine insufficiency.** *Curr Gastroenterol Rep* 2007, **9**:116.
24. Fahy BN, Frey CF, Ho HS, Beckett L, Bold RJ: **Morbidity, mortality, and technical factors of distal pancreatectomy.** *Am J Surg* 2002, **183**:237.
25. Johnson MA, Rajendran S, Balachandar TG, Kannan DG, Jeswanth S, Ravichandran P, Surendran R: **Central pancreatectomy for benign pancreatic pathology/trauma: is it a reasonable pancreas-preserving conservative surgical strategy alternative to standard major pancreatic resection?** *ANZ J Surg* 2006, **76**:987.

Publish with **BioMed Central** and every scientist can read your work free of charge

"BioMed Central will be the most significant development for disseminating the results of biomedical research in our lifetime."

Sir Paul Nurse, Cancer Research UK

Your research papers will be:

- available free of charge to the entire biomedical community
- peer reviewed and published immediately upon acceptance
- cited in PubMed and archived on PubMed Central
- yours — you keep the copyright

Submit your manuscript here:
http://www.biomedcentral.com/info/publishing_adv.asp

