THE RATIONALE OF RADICAL SURGERY FOR CANCER OF THE PANCREAS AND AMPULLARY REGION*

ALLEN O. WHIPPLE, M.D.

NEW YORK, N. Y.

FROM THE DEPARTMENT OF SURGERY, COLUMBIA UNIVERSITY, NEW YORK, N. Y.

UNTIL 1935, pancreaticoduodenectomy for cancer involving the pancreas was not attempted for the following reasons: (1) The duodenum was believed to be an essential part of the digestive tract. (2) The external secretion of the pancreas was believed to be indispensable for digestion of proteins and fats. (3) The significance of the fact that pancreatic juice ceases to flow and that acinar atrophy results with prolonged blockage of the ampulla and head of the pancreas with carcinoma was not properly understood or evaluated. (4) For these reasons, even with resections of part of the duodenum, every effort was made to reestablish the flow of bile and pancreatic juice into the duodenum or jejunum.

Halsted,[1] in 1898, was the first to carry out such an operation successfully. Doctor Hunt has summarized the collected cases of this type, some 110 in the literature and by personal communication. Because the unsuccessful operations have not been reported, the results are somewhat misleading in evaluating the collected cases, both as to operative mortality and the late results.

Nevertheless, for carcinoma limited to the papilla of Vater, transduodenal resection with reimplantation of the common and pancreatic duct into the duodenum offers definite advantages and this is especially true of the fungating or papillary type of carcinoma of the ampulla.

But not all cancers of the ampulla are of the fungating type, nor are all of the fungating growths relatively benign. Many of them infiltrate either the pancreas or the common duct, or the duodenum. Attempts to excise a segment of the head of the pancreas, wide of the growth, with a reimplantation of the ducts or head of the pancreas into the duodenum or jejunum have, in many instances, been associated with fatal hemorrhage, peritonitis, or duodenal fistula. This is especially true if catgut is used for ligatures and sutures. The activated pancreatic juice rapidly digests catgut. Surgeons, in the past, have hesitated to use silk or cotton because they considered the duodenum a contaminated field.

Following the fatal outcome, due to duodenal fistula and peritonitis, in a transduodenal excision of an ampullary carcinoma which I performed in 1935, we decided to undertake a more radical operation in two stages for the following reasons: (1) Coffey,[2] in 1909, and Mann and Kawamura,[3] in 1922, had demonstrated that the dog could survive total duodenectomy. (2) Patients with ampullary or pancreatic cancer were able to survive for months

* Discussion of Dr. Verne Hunt's paper read at the meeting of the American Surgical Association, White Sulphur Springs, W. Va., April 28, 1941.

TABLE I

FORTY-ONE COLLECTED CASES OF RADICAL PANCREATICODUODENECTOMY FOR CARCINOMA

(Collected from the Literature and from Personal Communications)
To April 15, 1941

	Operator	Reported in Journal	Stage	Ampullary	Pancreas	Duodenum	Common Duct	Died Post-oper.	Died After Operation	Surviving	Ca. with Metastases	Recurrence	Fistula Post-oper.
1.	Parsons	ANNALS OF SURGERY, **102,** 763, 1935	2	x					9 mos.				
2.	Whipple	ANNALS OF SURGERY, **102,** 763, 1935	2	x					28 mos.		x		
3.	Whipple	Amer. Jour. Surg., **40,**, n.s., 260, 1938	2		x				5 mos.		x		
4.	Schullinger-Parsons	Amer. Jour. Surg., **40,** n.s., 260, 1938	2		x			x					
5.	Janssen-Whipple	Amer. Jour. Surg., 40, n.s., 260, 1938	2		x			x					Biliary
6.	Whipple	Not reported	2[1]		x					15 mos.			Pancreatic
7.	Whipple	Not reported	2[1]		x			x					Pancreatic
8.	Whipple	Not reported	1		x					15 mos.			
9.	Whipple	Not reported	1			x		x					
10.	Trout	Personal communication	1		x			x					
11.	Janes	Personal communication	2	x				x					
12.	Janes	Personal communication	2			x				2 mos.			
13.	Hollenberg	Personal communication	2	x						35 mos.		x	
14.	Orator	Zentralblatt f. Chir., **64,** No. 25, 1936	2							5 mos.			Biliary
													Pancreatic
15.	Crile, Jr.	Am. Jour. Surg., Jan., 1940	2		x				18 mos.		x		
16.	Zinninger	Personal communication	2[1]	x						17 mos.			Pancreatic
17.	Zinninger	Personal communication	2[1]	x					4 mos.				Biliary
18.	Zinninger	Personal communication	1		x					3 mos.			
19.	Watt	Personal communication	2		x			x					
20.	Illingworth	Edinburgh Med. Jour., **46,** 331, 1939	2		x				5 wks.				
21.	Powers	Personal communication	2		x					3 mos.			
22.	Trimble	Personal communication	1	x						11 mos.			
23.	Luke	Personal communication	2		x					15 mos.			
24.	Pfeiffer	Personal communication	2			x			6 wks.				
25.	Horsley	In print. ANNALS OF SURGERY, 1941	1	x				x					
26.	Jones	Personal communication (Crile)	2		x					5 mos.			
27.	Freeman	Personal communication	2	x					5 mos.				
28.	Freeman	Personal communication	2	x						11 mos.			
29.	Freeman	Personal communication	2	x						1 mo.			Pancreatic
30.	Fallon	Personal communication	2				x		6 mos.				Biliary
31.	Fallon	Personal communication	2		x			x					
32.	Fallon	Personal communication	2[1]		x					2 mos			Biliary
33.	Fallon	Personal communication	1			x				1 wk.			
34.	Brunschwig	Surg., Gynec., and Obstet., **65,** 681, 1937	2		x			x					
35.	Brunschwig	Personal communication	2				x		3 mos.				
36.	Braunschwig	Personal communication	2		x			x					
37.	Roscher	Norsk. Mag. f. Laegevid., **98,** 777, 1937	2	x					5 mos.				
38.	Ransom	Personal communication (Hunt)	2	x									Pancreatic
39.	Orr	Tr. West. Surg. Assn., 1940	2	x						7 mos.			Pancreatic
40.	Hunt	Personal communication	1	x						1 yr.			Pancreatic
41.	Hunt	Personal communication	2	x									

[1] A modified two-stage procedure.

RÉSUMÉ OF MORTALITY INCIDENCE
FOLLOWING RADICAL OPERATIONS FOR CARCINOMA, WITH RESECTION OF DUODENUM AND PANCREAS

Collected Cases to April 15, 1941

	Two-Stage	Postop. Deaths	One-Stage	Postop. Deaths
Carcinoma of ampulla	16	2	4	2
Carcinoma of pancreas	14	7	2	0
Carcinoma of duodenum	2	1	1	0
Carcinoma of common duct	2	0		
Totals	34	10	7	2

Total operated cases	41
Postoperative deaths	12
Operative mortality	29.2%

deprived of both biliary and pancreatic contents in the gastro-intestinal tract, and showed an atrophy of disuse of the acinar tissue of the pancreas. (3) If bile could be restored by a short-circuiting procedure, the bleeding tendency would be corrected and digestion of fat improved. At the same operation a gastro-enterostomy would prepare the patient for the second stage, at which time radical removal of the duodenum and head of the pancreas, wide of the growth, would be undertaken.

Doctor Parsons and I[4] operated upon the first patient, employing the two-stage procedure, in 1935. At the second stage, a partial duodenectomy with excision of part of the head of the pancreas, with duodenoduodenostomy, but with exclusion of the pancreas from the digestive tract, was accomplished. In the second case I[4] performed a total duodenectomy, with excision of a part of the head of the pancreas. The patient lived 28 months, but died of liver metastases. Both of these patients digested 80 to 85 per cent of a measured fat intake, on several determinations. But both of them developed cholangitis because of the cholecystogastrostomy.

Because of the tendency for infectious material to be pushed into the gall-bladder and the development of a stenosis of the stoma with biliary infection, we[5] modified the short-circuiting procedure in the first stage to an end-to-end cholecystojejunostomy, with an end-to-side jejunojejunostomy. In some 31 such operations (the great majority of them palliative), we have found a very low incidence of cholangitis, and now strongly advise it as a first-stage procedure, rather than a cholecystogastrostomy.

But the two-stage procedure, as reported in the literature, and in personal communications to me by surgeons who know of my interest in the subject, carries with it certain hazards and complications which must be eliminated if the radical operation is to be considered worth while. The two most serious complications are postoperative bile and pancreatic fistula. In the 41 collected cases, there have occurred five bile and eight pancreatic fistulae (Table I). The former seldom close spontaneously, the latter usually do. The bile fistula is due to the cutting through of the silk or linen ligature used in tying off the common duct in the second stage. If possible, it is, undoubtedly, better

policy to implant the end of the common duct into the jejunum. Pancreatic fistula can be avoided by ligating the dilated pancreatic ducts before approximating the cut surfaces of the V-shaped excision in the head or body of the pancreas.

Now that we can prepare jaundiced patients for operations with vitamin K and bile salts, and can prevent shock by adequate measures, it is possible, in early and in selected cases, to undertake the radical operation in one stage. This avoids the hazard of two anesthesias and two major procedures.

I performed the first successful one-stage radical pancreaticoduodenectomy in March, 1940, removing the distal third of the stomach, the entire duodenum, and the head of the pancreas with an antecolic gastrojejunostomy and a choledochojejunostomy. This 47-year-old woman has regained 20 pounds, and is now living and free from any signs of jaundice or recurrence, 14 months after operation. The second patient upon whom I performed a similar one-stage procedure, in September, 1940, died of a postoperative pneumonia on the fourth day.

Fine silk technic should be used in all pancreatic surgery. Some of these patients will show a poor fat digestion, others good digestion. We are carrying out a series of experiments to explain this discrepancy. Pancreatic extract should be given to those who show fat indigestion. In our patients who have died following the radical two-stage procedure, we have not found fatty liver degeneration. However, it may be wise to give these patients lipocaic after operation.

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