Gut, 1968, **9**, 311-315

Chronic pancreatitis and choledochoduodenal anastomosis

M. KECLÍK, P. FRIČ, V. ŠMAT, AND V. FRIEDBERGER

From the Medical Department and Second Research Laboratory for Gastroenterology, Faculty of General Medicine, and the Second Surgical Clinic, Charles University, Prague, Czechoslovakia

No standard method is used in the surgical treatment of chronic pancreatitis; it is, however, agreed that concomitant affections of the biliary tract should be eliminated.

Anastomosis between the bile ducts and the alimentary tract in the treatment of chronic pancreatitis has not been evaluated. Its use depends on the extent that the theories of the common channel and of obstructive pancreatitis are acccepted and whether the enlarged head of the pancreas is obstructing the flow of bile mechanically. These factors do not play an equal role in all patients. An adequate operation on the biliary system relieves the recurring attacks of some patients who have pancreatitis when concomitant affections of the biliary tract and pancreas are present (biliary pancreatitis) and drainage of the common bile duct will suppress the biliary symptoms of pancreatitis if these are marked. It is, however, difficult to obtain evidence that this operation also relieves stasis in the duct of Wirsung.

We have investigated this problem by following the changes of the pancreatic enzymes in serum after the administration of secretin (provocative secretin test). It is known that in some patients with chronic pancreatitis, due to rising intraductal pressure when external secretion is stimulated, the activity of pancreatin enzymes in blood serum rises, so long as the gland is able to produce sufficient secretion. The mechanism which operates may differ only quantitatively from one of the causes of elevation of serum enzyme activity in acute pancreatitis. We assumed that if biliary-digestive anastomosis released pressure both within the bile ducts and the pancreatic ducts, the serum enzyme activity after stimulation in patients with pancreatitis treated by anastomosis should not differ from controls. Our observations have demonstrated that this is not the case.

MATERIAL AND METHODS

Eighty patients were divided into four groups of 20 (Table I). In the control groups A and C no pancreatitis was found at operation. In group A simple cholecystectomy for cholelithiasis and in group C choledochoduodenal anastomosis for common bile duct disease was performed. Group B comprised patients with clinical or surgical evidence of pancreatic disease but with no choledochoduodenal anastomosis, and group D those patients in whom choledochoduodenal anastomosis was performed for pancreatitis associated with markedly dilated bile ducts. Elevations of serum pancreatic enzymes were accepted as clinical evidence of pancreatitis during attacks of pain in subjects in whom cholangiography was normal. The surgeon considered pancreatitis to be present if the gland was enlarged, swollen, firm to touch with hard areas and foci of necrosis, and if inflammatory changes were present in the omental bursa. Twice an erroneous diagnosis of tumour was made. Four subjects of group D experienced occasional attacks of pancreatic pain after operation. In all the patients in groups C and D the patency of the anastomosis was checked by means of barium suspension. None of the 80 patients had clinical or laboratory signs of manifest liver disease. The clinical characteristics of groups B and D are recorded in Table II, and the operative findings in groups C and D in Table III.

TABLE I

CLASSIFICATION OF 80 PATIENTS

Group	*Pancreatitis*	*Choledochoduodenal Anastomosis*
A: 20 control subjects after cholecystectomy	−	−
B 20 subjects	+	−
C 20 subjects	−	+
D 20 subjects	+	+

After withdrawing fasting blood specimens 75 U of secretin (Vitrum) was given and serial blood specimens were taken after one, two, and four hours. In the blood specimens the amylase activity was assessed by a modification of Teller's method (1950), lipase according to Raderecht's method (1959), and alkaline phosphatase according to Kind and King (1954). All patients were ambulant. Values of 170 U for amylase and of 3 I.U. for lipase are considered the upper limits of normal in unstimulated patients (Frič and Herfort, 1963).

TABLE II

CLINICAL SUMMARY

Clinical Data	Two Groups of 20 Patients	
	B	D
Attacks of pain in past	19	20
Steatorrhoea	1	1
Calcification	2	—
History of pancreatitis	7	9
Pseudocysts	5	—
Evidence of pancreatitis on operation	12	20
Elevated blood enzyme levels during observation	7	—
Cholecystectomy	13	20
Exploratory laparotomy	2	2
Revision of the bile duct (re-operation)	—	4
Diabetes	—	4
Attacks after last surgery or during conservative treatment	12	4
Subsequent secretin test (duodenal intubation) with proved pancreatic hypofunction	2	6

TABLE III[1]

FINDINGS AT OPERATION

Group	Operation	Findings at Operation	No. of Cases
C[2]	First	Cholecystolithiasis	2
		Cholecystolithiasis and choledocholithiasis	7
	Second	Choledocholithiasis	9
		Cholangitis	1
		Common bile duct stricture	1
D[3]	First	Cholecystolithiasis	8
		Cholecystolithiasis and choledocholithiasis	2
		Cholecystitis	6
	Second	Choledocholithiasis without calculi	1
			3

[1]A grossly dilated common bile duct was found in all instances.
[2]No chronic pancreatitis
[3]Chronic pancreatitis in all instances.

TABLE IV

AMYLASE AND LIPASE SERUM LEVELS AFTER SECRETIN

	Amylase Levels				Lipase Levels			
	Fasting	Hours after Secretin			Fasting	Hours after Secretin		
		1	2	4		1	2	4
Group A								
Ad.	91	80	63	144	1·23	2·02	0·97	1·81
Kan.	101	91	134	150	0·73	0·49	0·24	2·14
Kau.	71	59	46	105	0·88	0·53	1·23	0·58
Ba.	120	129	143	162	0·53	1·22	1·84	1·40
Mle.	84	153	127	161	0·69	0·19	—	1·24
Rub.	197	148	181	78	0·17	0·17	0·17	0·32
Vo.	73	44	50	166	1·04	0·77	0·83	1·65
Urb.	112	86	105	36	0·33	0·16	0·16	2·68
Sa.	32	52	49	114	1·78	0·18	1·43	0·67
No.	40	49	36	134	2·88	1·19	1·79	1·17
Chla.	58	34	39	87	0·56	0·56	0·93	3·44
Chy.	36	26	23	60	1·54	1·15	1·44	1·60
Fu.	44	60	44	29	1·43	1·59	0·48	0·96
Kla	82	93	98	78	1·61	1·61	1·96	1·52
Du.	95	76	79	95	1·33	0·75	1·00	0·83
Sve.	104	95	95	90	0·38	0·68	1·51	0·07
Pa.	93	87	78	220	1·42	1·78	2·66	1·32
Sa.	102	148	144	136	0·28	0·84	0·56	0·20
Je	93	81	93	85	0·44	0·53	0·09	0·53
Po.	89	75	87	86	2·26	0·72	0·72	0·90
$\bar{x} + 2{,}58\sigma$	178·0	178·5	196·5	233·4	2·85	2·29	2·89	3·40
Group B								
Ne.	68	51	60	78	2·31	*4·19*	*2·96*	*4·48*[2]
Ho.	143	136	140	160	1·11	0·32	0·56	1·27
Ge.	93	93	67	98	1·33	0·53	0·53	0·53
Mra.	68	81	75	—	0·16	0·73	0·82	—
May.	100	110	134	105	0·08	1·14	0·89	1·52[2]
Sty.	29	39	58	68	2·35	0·99	2·42	1·51
Na.	82	83	98	24	0·08	0·49	0·16	2·35[2]
Ma.	100	98	100	60	1·61	1·18	0·25	1·63[2]
Le.	107	99	99	163	2·39	1·90	0·47	*4·40*[2]
Je.	*179*	167	*209*	229	0·89	1·61	0·89	1·25
Vi.	42	51	35	36	1·43	1·03	1·19	0·16[2]
Su.	57	53	53	117	1·19	0·60	1·49	0·94[2]
Jo.	*328*	*383*	*405*	*763*	0·18	0·09	0·63	0·18[2]
Ho.	107	104	93	77	0·67	0·50	0·67	1·33
We.	127	127	118	88	0·08	1·48	1·40	2·83
PO.	56	87	78	126	*3·68*	1·74	1·26	1·17[2]
Fi.	55	77	62	151	2·45	1·50	2·45	1·66[2]
Pok	136	—	102	65	2·31	—	*3·10*	2·84[2]
Va.	71	84	83	155	1·25	*2·32*	0·89	0·35[2]
Ry.	58	72	115	96	0·63	1·50	1·16	*3·77*

[1]Results in italics denote raised values compared with those of groups A and C.
[2]Patients with attacks.

RESULTS

The serum amylase and lipase values are given in Table IV. Alkaline phosphatase activity did not change during the period of observation. From the results in groups A and C the means and standard deviations were calculated. Values in compared groups were considered to be elevated if they exceeded the mean $\bar{x} + 2{\cdot}58\,\sigma$ (Howat, 1958, 1962).

When groups A and B are compared a high amylase activity was found in six specimens from two subjects and a high lipase activity in eight specimens from six subjects of the group B. In patients Ne and Jo, the test was performed soon after an acute attack of pancreatitis and in the former a pseudocyst was later drained. Patient Je suffers from the painless form of chronic pancreatitis with pancreatic calcification and steatorrhoea.

When the data of groups C and D are compared, using the upper limit of normal in C as control, amylase activity was elevated seven times in five subjects of group D and the lipase activity in three subjects.

If we take group A to act as the control for the other groups B, C, and D we find in group B a rise of both enzymes in 14 specimens from eight subjects, in group C a rise in nine specimens from five patients, and in group D in 14 specimens from six subjects.

In group B 12 patients suffered from attacks of pancreatitis during the period of observation. On

TABLE IV—*continued*

AMYLASE AND LIPASE SERUM LEVELS AFTER SECRETIN

	Amylase Levels				*Lipase Levels*			
	Fasting	*Hours after Secretin*			*Fasting*	*Hours after Secretin*		
		1	*2*	*4*		*1*	*2*	*4*
Group C								
Ze.	75	78	99	—	2·24	1·54	1·62	2·76
Ži.	148	96	139	—	1·78	0·89	2·92	4·70
Zo.	59	76	55	68	0·16	0·88	0·24	0·40
Vo.	99	70	40	118	0·16	0·16	1·97	0·15
Šle.	64	46	73	52	1·04	0·64	1·36	1·61
Ša.	142	102	138	121	1·14	0·38	0·30	0·38
Str.	49	102	93	42	0·33	0·25	1·06	0·44
Se.	117	91	93	144	1·41	0·50	0·34	0·08
Ra.	131	252	205	164	0·70	0·96	1·75	1·33
Pe.	89	145	197	255	0·62	0·53	1·06	2·06
Ber.	49	53	62	91	1·18	1·28	0·20	1·44
Me.	191	241	165	164	0·91	0·15	0·15	0·53
Ma.	99	63	115	113	1·50	1·83	2·74	1·22
Le.	127	119	145	116	0·66	0·17	1·08	0·86
Kej.	93	178	190	252	0·17	1·82	0·33	0·52
Fi.	118	118	122	192	1·09	0·76	0·25	0·76
Di.	160	138	118	96	1·40	0·44	2·28	2·36
Ba.	40	44	32	87	2·45	2·28	1·03	0·71
Bart.	56	56	84	74	0·74	0·89	0·30	0·31
Maj.	36	36	39	102	0·68	0·58	0·78	0·08
$\bar{x} + 2{\cdot}58\sigma$	200·1	261·1	245·6	281·4	2·58	2·41	3·31	3·95
Group D								
Olš.	164	155	170	58	1·11	0·34	0·25	1·15[2]
Bo.	79	61	39	69	0·72	0·64	0·97	0·97
Fi.	173	165	159	125	0·82	0·49	0·33	1·18
Fo.	108	105	89	83	1·38	1·08	1·58	2·24
Há.	53	*322*	*358*	*335*	2·19	*4·47*	2·75	3·00[2]
Ho.	74	87	134	67	1·33	1·47	0·45	0·71
Krej.	142	190	*264*	113	0·51	0·73	0·22	2·38
Ma.	76	70	74	55	—	0·20	0·39	0·88
Mad.	128	128	128	*292*	1·34	1·00	1·17	*4·05*
No.	74	87	74	159	0·78	0·94	1·33	*5·00*[2]
Pě.	114	124	145	156	0·97	1·22	1·48	0·76
Sau.	137	195	137	*290*	0·70	0·90	0·09	1·87
Ru.	94	80	95	173	0·35	0·26	0·35	0·76
Sto.	83	177	168	66	0·25	0·51	1·11	1·15
Štol.	184	143	216	*300*	1·06	1·58	0·79	2·38
Vo.	113	132	128	118	0·36	0·98	1·25	0·45
PO.	70	101	109	132	0·54	0·63	1·34	1·63
Chva.	100	106	121	163	0·17	0·34	0·25	0·51[2]
Bu.	69	69	57	69	1·76	0·35	0·44	0·35
Mu.	45	41	47	95	1·54	1·36	0·96	0·27

[1]Results in italics denote raised values compared with those of groups A and C.
[2]Patients with attacks.

secretin stimulation, in six of them a raised serum amylase or lipase level in at least one specimen was found. Conversely, two patients with raised enzyme activity after stimulation did not suffer from attacks. In group D four patients had occasional acute attacks. In two of them all values were normal. Four of six subjects with a raised activity in any specimen did not suffer from acute attacks.

DISCUSSION

If we compare the serum enzyme values in patients of groups B, C, and D with group A we find that there are no fundamental differences between groups B and D under the conditions of this investigation. In group B a considerable proportion of patients suffered from attacks of pancreatitis, while in group D during the period of observation only isolated attacks were recorded.

These two groups differ in some clinical respects. In group B the part played by simultaneous biliary disease in the symptoms and mechanism of pancreatitis was not very marked, as these patients lacked gross changes of the bile ducts on surgery or their biliary tracts were normal. Cholecystectomy did not influence the course of the disease in any significant way. Pseudocysts of the body and tail of the gland frequently developed and the mild involvement of the head of the pancreas was accompanied by few symptoms and signs of bile duct involvement. In group D there was marked biliary disease with gross changes in the bile ducts and frequently also prominent biliary symptoms even though in almost half the patients inflammatory changes without calculi were present. For this reason choledochoduodenal anastomosis was selected as the method of treatment of choice in this group. In these patients the effect of the operation was often dramatic and even in those who continue to suffer from attacks after operation the condition is considerably improved. It seems, therefore, that groups B and D include patients with pancreatitis of differing aetiology, though both respond to stimulation by secretin in the same manner.

In this study we limited surgical exploration to confirm pancreatitis morphologically. The surgeon can diagnose pancreatitis by inspection and palpation or after cholangiography and pancreatography. These methods are liable to considerable error. The feasibility and hazards of biopsy were discussed but even this method is not reliable in demonstrating inflammatory changes which may be focal. More readily evaluated are larger specimens from a pancreas diffusely affected as are obtained by distal pancreatectomy. In this series we have tried to reduce our sampling error by a careful selection of patients but we are well aware that errors in diagnosis may have occurred. The raised values in our test results in group C may be due to the fact that the surgeon did not recognize at operation minor evidence of chronic pancreatitis or that chronic pancreatitis had not yet developed in these patients though conditions were present which lead to enhanced activity of pancreatic serum enzymes after stimulation by secretin.

The provocative secretin test must be also subjected to criticism. Since the original work of Lagerlöf (1945) various authors have used different methods with varying diagnostic success. Dreiling and Richman (1954) criticized the test and summarized the circumstances which influence results—the condition of the sphincter of Oddi, patency of the ducts of Wirsung and Santorini, the extent of damage to the gland, the presence of acute inflammation—and finally denied the diagnostic value of the method. Howat (1958) and Sun and Shay (1957) and others, using a different method of evaluation, and in particular after reinforcing the stimulation of secretin by pancreozymin, consider the provocative test a satisfactory preliminary test. In the present work we were not concerned with the diagnostic value of the test which to us seemed to be limited. However, regardless of these limitations some conclusions can be drawn from the above observations.

Important factors in the pathogenesis of chronic pancreatitis are stasis and inflammation in the biliary ducts, reflux through a common channel, and obstruction to the free flow of the pancreatic juice. Choledochoduodenal anastomosis can eliminate the first two mechanisms and the third under favourable anatomical conditions, if the obstruction lies outside the gland. If we are correct in interpreting the mechanism of changes registered during the provocative secretin test, the favourable effect of any operation on the mechanism of stasis should manifest itself by a negative result of the test. In a significant number of subjects in our series with choledochoduodenal anastomosis carried out because of pancreatitis or, in its absence, a rise of pancreatic serum enzymes was recorded after stimulation with secretin. It seems, therefore, that in a considerable number of patients with the biliary form of chronic pancreatitis this operation does not eliminate this basic mechanism of the disease though its favourable effect on the clinical course of the disease is manifest.

SUMMARY AND CONCLUSIONS

Patients with chronic pancreatitis with or without choledochoduodenal anastomosis respond, when

compared with a control group, by an approximatively equal rise of activity of pancreatic serum enzymes after secretin stimulation. The positive result of this 'provocative secretin test' is interpreted as evidence of obstructed flow of pancreatic juice. Thus it does not appear that choledochoduodenal anastomosis eliminates this mechanism of producing the disease, though it frequently has a favourable effect on the course of biliary pancreatitis.

REFERENCES

Dreiling, D. A., and Richman, A. (1954). Evaluation of provocative blood enzyme tests employed in diagnosis of pancreatic disease. *Arch. intern. Med.*, **94**, 197-212.

Frič, P., and Herfort, K. (1963). Laboratory diagnosis of pancreatic disease. In *Balneologia et Balneotherapia*, Stàtní láfnet, Karlovy Vary.

Howat, H. T. (1958). Investigation of pancreatic dysfunction. In *Modern Trends in Gastroenterology*. 2nd Series, edited by F. A. Jones, pp. 401-416. Butterworth, London.

—— (1962). In discussion to Dreiling D. A., and Janowitz, H. D. The measurement of pancreatic secretory function. *Ciba Foundation Symposium on the Exocrine Pancreas*, edited by A. V. S. de Reuck and M. P. Cameron, pp. 253-258. Churchill, London.

Kind, P. R. N., and King, E. J. (1954). Estimation of plasma-phosphatase by determination of hydrolysed phenol with amino-antipyrine. *J. clin. Path.*, **7**, 322-326.

Lagerlöf, H. (1945). Normal esterases and pancreatic lipase in the blood. *Acta med. scand.*, **120**, 407-436.

Raderecht, H. J. (1959). Zur Bestimmung der Serumlipase. *Clin. chim. Acta*, **4**, 221-226.

Sun, D. C. H., and Shay, H. (1957). Value of combined study of serum enzymes and duodenal contents after secretin in the diagnosis of diseases of the pancreas. *Gastroenterology*, **32**, 212-231.

Teller, J. D. (1950). Measurement of amylase activity. *J. biol. Chem.*, **185**, 701-704.