Clinical Topics

Rational sequence of tests for pancreatic function

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Summary

Of 144 patients with suspected pancreatic disease in whom a ^{75}Se -selenomethionine scan was performed, endoscopic retrograde pancreatography (ERP) was successful in 108 (75%). The final diagnosis is known in 100 patients and has been compared with scan and ERP findings. A normal scan reliably indicated a normal pancreas, but the scan was falsely abnormal in 30%. ERP distinguished between carcinoma and chronic pancreatitis in 84% of cases but was falsely normal in five patients with pancreatic disease. In extrahepatic biliary disease both tests tended to give falsely abnormal results. A sequence of tests to provide a rapid and reliable assessment of pancreatic function should be a radio-isotope scan, followed by ERP if the results of the scan are abnormal, and a Lundh test if the scan is abnormal but the findings on ERP are normal.

Introduction

The investigation of patients with suspected pancreatic disease still presents considerable practical problems to the clinician. Symptoms may be attributed to other abdominal diseases and the results of tests such as the detection of steatorrhoea are not specific. Biochemical investigation of duodenal aspirate, after pancreatic stimulation, is of definite value in detecting pancreatic insufficiency but may be normal in the presence of pancreatic disease.^{1,2} ^{75}Se -selenomethionine scanning rarely misses pancreatic abnormality but carries a high incidence of falsely

abnormal results and does not distinguish between the causes of pancreatic disease. More recently, endoscopic retrograde pancreatography (ERP) has permitted direct visualisation of the pancreatic duct.³

This technique may provide an accurate pathological diagnosis, but it is more invasive and hazardous than other tests of pancreatic function. We attempted to evaluate scanning and ERP in relation to other tests to determine the most efficient combination or sequence of tests in the routine clinical diagnosis of pancreatic disease.

Patients and methods

The study is based on all patients who have had a ^{75}Se -selenomethionine pancreas scan and attempted ERP in our hospital over the past three years. Both conventional and subtraction pancreas scans⁴ were performed. ^{75}Se and tryptic activity was measured in duodenal aspirate² after giving ^{75}Se -selenomethionine intravenously and a Lundh test meal by mouth. ERP was performed with an Olympus JFB2 side-viewing duodenoscope. After cannulation of the pancreatic duct, 60% sodium diatrizoate (Hypaque) was injected and x-ray pictures were taken. The scans and pancreatograms were reported on by two observers without reference to the result of the other investigation.

The scan usually preceded ERP, but when ERP was performed first the scan was delayed for six weeks because pancreatography may affect the scan image.

DIAGNOSTIC CRITERIA

We assessed 108 patients in whom ERP was successful and established their diagnosis without reference to the scan or pancreatography findings (table I). All patients not diagnosed at laparotomy or necropsy have been followed up for at least a year; patients with chronic pancreatitis improved on pancreatic replacement treatment and have remained well.

All six patients with relapsing pancreatitis had at least two attacks of severe upper abdominal pain with raised serum amylase levels. Steatorrhoea occurred with acute episodes in three of the patients tested, and two patients who were studied had abnormal Lundh tests. Upper abdominal pain and serum amylase levels above 1000 Somogyi units occurred in those patients with acute pancreatitis. Of 19 patients with extrahepatic biliary disease, 10 had obstruction caused by common duct stones, seven had bile duct strictures (four carcinoma, three benign), and two had ampullary carcinoma. The

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TABLE I—Diagnostic classification of patients

	No of patients	Diagnosis based on laparotomy or necropsy	Diagnosis based on follow-up together with			
			Lundh test faecal fat	Lundh test alone	Faecal fat alone	Raised serum amylase levels
Normal	34	7	9	5	13	
Carcinoma of pancreas	15	15				
Chronic pancreatitis	22	9	12		1	
Relapsing pancreatitis	6	1				5
Acute pancreatitis	4	2				2
Extrahepatic biliary disease	19	19				

diagnosis remains uncertain in eight patients. Three patients have not attended for follow-up, and the five patients with abnormal scans and pancreatograms probably have chronic pancreatitis, but carcinoma has not definitely been excluded.

Results

Of the 144 patients included in the study, a satisfactory pancreatogram was obtained in 108 patients (75%). The scan and ERP appearances correlated with the final diagnosis are shown in table II.

TABLE II—Scan and ERP findings in 108 patients

Scan: ERP:	N N	ABN N	N ABN	ABN ABN	Total No of patients
Normal pancreas	24	10			34
Carcinoma pancreas		2	1	12	15
Pancreatitis:					
Acute		2		2	4
Relapsing		1		5	6
Chronic		2		20	22
Biliary disease (extrahepatic):					
N pancreas	3	2		3	8
ABN pancreas		1		10	11
Undecided diagnosis	1	2		5	8

N = Normal. ABN = Abnormal.

FIG 1—(a) Normal scan. (b) Normal pancreatogram.

Normal patients (fig 1)—ERP was normal in all 34 patients. A falsely abnormal scan was found in 10 patients (29%); half of these occurred in patients with conditions known to affect the pancreatic scan—cirrhosis (3), diabetes mellitus (1), and previous partial gastrectomy (1).

Carcinoma of the pancreas (fig 2)—No patient had a normal result from investigation by both techniques. The only falsely normal scan occurred in this group, and two patients had normal pancreatograms but abnormal scans. Only three of the 15 patients were jaundiced.

Pancreatitis—All patients had abnormal scans. ERP was normal in five patients—two had chronic, two acute, and one acute relapsing pancreatitis.

FIG 2—Carcinoma of body of pancreas. (a) Scan showing isotope uptake only in head of pancreas. (b) Pancreatogram showing parenchymal filling in head of pancreas only.

Extrahepatic biliary disease—Of eight patients with a normal pancreas, only three had a normal scan and five had a normal ERP. All patients found to have an abnormal pancreas at laparotomy had scan defects and 10 out of 11 an ERP suggesting pancreatitis.

BLIND REPORTING OF PANCREATOGRAMS

A correct distinction between carcinoma and chronic pancreatitis was made in 26 (84%) of 31 patients (table III). The four patients erroneously diagnosed as pancreatic carcinoma had severely abnormal pancreatograms, two showing strictures of the main pancreatic duct and two showing no filling of the distal duct.

Discussion

The pancreatic scan cannot differentiate between chronic pancreatitis and carcinoma and tends to give false-positive results. In this series, 15 patients with a normal pancreas had an abnormal scan. Five of these had diseases known to affect the pancreatic image,^{4, 5} and five had extrahepatic biliary obstruction. The scan was reliable in showing a normal pancreas, with a false-negative rate of less than 2%. This contrasts with duodenal intubation tests, which are reliable only when pancreatic abnormality is shown but which may be normal in up to 30% of patients with pancreatic carcinoma.^{1, 2} The results of intubation tests are particularly unreliable if the lesion is not situated in the head of the pancreas,⁶ and they also give normal results in an appreciable proportion of patients with pancreatitis.

TABLE III—Results of blind reporting in 31 patients with abnormal pancreatograms

	Chronic pancreatitis (20)	Carcinoma pancreas (11)
Pancreatitis:		
Definite	11	1
Probable	5	
Carcinoma:		
Definite	2	6
Probable	2	4

ERP was reliable in showing the normal pancreas in patients without extrahepatic biliary disease. Nevertheless, the technique gave a misleading result in eight patients with pancreatic disease, including two with chronic pancreatitis and two with carcinoma. This is an important practical point, because in these cases with a falsely normal pancreatogram the abnormal scan might be disregarded unless supported by other evidence of pancreatic abnormality. In the presence of extrahepatic biliary disease an abnormal scan or an abnormal pancreatogram should be interpreted with caution as both tests showed a tendency to give falsely abnormal results. In patients with biliary obstruction, however, the abnormal pancreatogram did not falsely suggest carcinoma of the pancreas, and simultaneous retrograde cholangiography often provided the diagnosis.⁷

The blind reporting of the pancreatograms correctly distinguished between chronic pancreatitis and carcinoma in 84%. A disadvantage of ERP in this series was the high rate of failure to obtain a pancreatogram (25%)—partly caused by initial inexperience with this difficult technique. The invasiveness of ERP makes it unattractive as a first-stage procedure, and complications may occur.⁸⁻⁹ We have found hyperamylasaemia in 20% of patients but clinical pancreatitis only in 3%.¹⁰ Septicaemia may occur in the presence of an obstructed biliary tree, and filling of pseudocysts must be avoided.⁸

On the basis of this series and the experience of other groups¹¹⁻¹⁴ we propose a sequence of tests to provide a rapid and reliable assessment of patients with suspected pancreatic disease (fig 3). This figure illustrates the proposed test sequence using the 81 patients of this series with carcinoma of the pancreas or pancreatitis or with a normal pancreas. The remaining 19 patients with extrahepatic biliary disease not caused by carcinoma of the pancreas are not included as their diagnosis would usually be determined from the retrograde cholangiogram, and neither scan nor ERP have proved reliable in determining whether or not pancreatitis is present in these patients.

The first stage in the sequence is the radioisotope scan. A normal scan precludes the necessity for further investigation since it is a reliable indicator of a normal pancreas. An abnormal scan should be followed by ERP, which when abnormal has a high chance of producing a definite diagnosis. This leaves a small group with an abnormal scan but a normal retrograde pancreatogram—a diagnostically unhelpful combination—with a mixture of false-positive scans and false-negative pancreatograms. The final stage in these patients should be a Lundh test, which—if abnormal—reliably indicates pancreatic disease. The

proposed sequence of tests would have correctly diagnosed 78 of the 81 patients (fig 3), although one with carcinoma would have been missed.

There are three potential sources of error. The false-negative scanning rate for carcinoma is about 4%; these patients will still be missed. Up to 30% of patients with pancreatic carcinoma may have a normal Lundh test result, although the combination of this with a falsely normal pancreatogram should be a rare event and was not seen in this series. A falsely abnormal Lundh test may occur in diabetes mellitus or after gastric surgery, when the scan also tends to be falsely abnormal. Nevertheless, it should still be possible to achieve a diagnostic accuracy of well over 90%.

We have previously advocated performing duodenal intubation simultaneously with the scan² to measure duodenal radioselenium as well as tryptic activity, but this is no longer necessary. An intubation test result in agreement with the scan would not alter the decision whether or not to proceed to ERP. Patients with an abnormal scan but a normal intubation test would still need ERP because of the false-negative rate of the intubation test. An abnormal intubation test result is rarely seen in conjunction with a normal scan.

The strategy of only performing Lundh tests on patients with an abnormal scan but normal ERP greatly reduces the number of Lundh tests required—with an attendant saving in effort, cost, and patient discomfort. Furthermore, the Lundh test may, in the future, be superseded by analysing pancreatic juice collected during ERP after pancreatic stimulation. Cytology of the juice may help in detecting carcinoma.^{16, 17} These procedures should further enhance the accuracy of the scanning-ERP sequence and make possible a reliable assessment of the pancreas on a single day.

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FIG 3—Proposed sequence for tests of pancreatic function.

A middle-aged woman had a dilatation and curettage and subsequently complained of passing air through her vagina. What might be the explanation?

The dilatation and curettage may or may not have been the proximate cause of this symptom. Spontaneous fistula between the gut and the genital tract, through which gas from the bowel might escape, is most often caused by diverticulitis or carcinoma of the colon. From the nature of the question it would be unlikely for a genital cancer to be present. Conceivably instrumentation of the uterus could have been the final cause of breakdown of a developing fistula. Perhaps more common and not generally recognised is that if the introitus is lax as a result of childbirth then in certain positions (especially bending down) the vagina will fill with air and be noisily and embarrassingly expelled when the woman stands up, as she increases her intra-abdominal pressure and forces the vaginal walls together again. Possibly this patient noticed the symptom of vaginal flatus after her minor operation, and the dilatation and curettage was not the cause of the problem. Treatment is by colpoperineorrhaphy.