Pancreatic Society of Great Britain and Ireland

The 10th Annual Meeting of the Pancreatic Society of Great Britain and Ireland was held at Southmead Hospital, Bristol on 22 November 1985, under the Presidency of Professor Robin C N Williamson. Abstracts of the papers presented at the meeting are printed below.

Value of endoscopic retrograde cholangiography in the identification of biliary causes of acute pancreatitis

M J R Lee, T K Choi, F C S Lai, K P Wong, H Ngan, and J Wong (Department of Surgery, University of Hong Kong, and Institute of Radiology and Oncology, Queen Mary Hospital, Hong Kong, Introduced by V Mellikian, Dudley Road Hospital) Accurate early detection of biliary disease in patients presenting with acute pancreatitis can be difficult. Conventional imaging techniques are not entirely reliable, and the value of clinical and biochemical indices has been questioned. We have therefore used endoscopic retrograde cholangiography (ERC) with increasing frequency since 1979 to investigate the biliary tract soon after resolution of acute pancreatitis. During six years ERC was attempted on 150 patients, 134 of whom had suffered their first attack of pancreatitis. Seventy one per cent were examined within three weeks of the acute illness and the success rate was 88%, the major reason for failure being papillary oedema. Biliary calculi were demonstrated in 67 (51%) of the 132 cholangiograms obtained. They were situated in the gall bladder in 44 (33%) and in the bile ducts in 29 (22%). The gall bladder did not fill in 13, always in association with cholelithiasis. No patient with a normal ERC was subsequently found to have biliary disease, although seven of those in whom ERC failed were later shown to have gall stones. Thus overall ERC identified 91% of those with gall stone pancreatitis. Pancreatograms were obtained in 111 patients, and 15 were abnormal: eight showed chronic pancreatitis, five ductal obstruction or stenosis, one a small pseudocyst, and one pancreas divisum. The complication rate was low, mild pancreatitis being provoked in two patients (1.3%).

We conclude that endoscopic retrograde cholangiopancreatography may be carried out safely soon after resolution of acute pancreatitis, and will identify with certainty those patients who require biliary surgery.

Subcutaneous oxygen tension in the prediction of severe acute pancreatitis

P J Billings, D J Leaper, and R C N Williamson (University Department of Surgery, Bristol Royal Infirmary, Bristol) The outcome of acute pancreatitis (AP) is more unpredictable than any other acute abdominal condition. Several clinical and biochemical parameters can provide a prognostic guide to management but still fail to identify some patients who subsequently develop severe disease. To assess the level of tissue perfusion immediately after admission a silastic oxygen-permeable tube was implanted subcutaneously in the upper arm of eight patients with acute pancreatitis (serum amylase > 1200 units/litre). A polarographic oxygen electrode system was used to measure the subcutaneous partial pressure of oxygen (ScpO2). Subcutaneous perfusion was compared with a multiple prognostic factor index in each case. Five patients who were predicted to have a mild attack were well perfused, basal ScpO2, was a median of 62 mmHg (range 48–72) and increased to a median of 84 mmHg (range 59–100) after 50% oxygen by mask for 30 minutes. The three patients who were predicted to have a severe attack of AP had a lower ScpO2 (median 36; range 36–60) with a poor response (median 44; range 41–59) to increased inspired oxygen.

Measurement of ScpO2 is a simple technique for estimating tissue perfusion and may help to predict a severe attack of AP at an early age.

References


Different techniques in operative pancreatectomy

M J Cooper and R C N Williamson (University Dept of Surgery, Bristol Royal Infirmary, Bristol) Visualisation of the entire pancreatic ductal tree is essential in planning a rational surgical approach in chronic pancreatitis. Although endoscopic pancreatography allows this to be performed preoperatively, it may not be feasible or provide adequate information. In these circumstances operative pancreatography is of great value. Between 1978 and 1985 it was undertaken in 63 patients (mean age 48 years, range 14–75 years) using one of four different techniques. Final diagnoses were chronic pancreatitis (27), isolated dorsal pancreas (12), carcinoma head of pancreas (four), acute pancreatitis (seven) and miscellaneous pancreatic conditions (13). Retrograde pancreatograms were successfully obtained in 17 of 21 patients, including four via the minor papilla and two by cannulation of the duct after transsection of the neck of pancreas; where necessary secretin (1 µ/kg) was administered to visualise the duct before cannulation. Prograde cannulation was achieved after distal pancreatectomy in 21 of 22 patients, 12 of whom had an isolated dorsal pancreas. ‘Ambigrade’ pancreatography was performed after direct puncture of a palpable duct in 10 patients and cystography in another 9 patients with pseudocysts; one patient had an intraoperative fistulogram. No complications of pancreatography were seen and the radiological findings modified the operative procedure in 26 patients (41%).

Carinoma of the ampulla—what is the prognosis?

J F R Robertson and C W Imrie (Royal Infirmary, Glasgow) Patients with ampullary carcinoma are regarded as having a moderately good prognosis. Well differentiated tumours resected by pancreateoduodenectomy have been associated with a five year survival rate in excess of 60%.

Most large series of patients with ampullary carcinoma are from well known American centres reporting results on selected patients undergoing radical
surgery. Few British patients have been studied and therefore the prognosis for this disease over the total practice of a single teaching hospital is unclear.

Forty one patients (41% secondary referrals) presented between 1959 to 1983 with ampullary carcinoma. Twenty six (63%) underwent radical surgery (by eight different surgeons); eight (20%) local excision of the tumour; six (15%) bypass procedures and one was treated by endoscopic sphincterotomy (2%). Potentially curative resection was done in 83% of the 41 patients. The operative mortalities for radical, local and bypass surgery were 7-7%, 25%, and 16-6% respectively. In the largest group (radical surgery) there was a significant difference in survival related to tumour differentiation (p<0.05). The presence of local spread did not significantly affect survival of the patients treated radically. The latest five year survival figures relate to 27 patients operated on up to 1979, 81% of whom had ‘curative’ resections. Despite the high ‘curative’ resection rate the five year survival for radical, local and bypass surgery was 23-5%, 40% and 0% respectively.

From this study radical surgery is the best approach in terms of operative mortality, although the five year survival is disappointing.

Reference

Pylorus preserving proximal pancreatectomy

M J COOPER, W K ELTRINGHAM, AND R C N WILLIAMSON (Department of Surgery, Bristol Royal Infirmary, Bristol) Conventional pancreatoduodenectomy (Whipple’s resection) includes resection of the distal stomach and duodenum. To the patient with pancreatic failure this procedure adds all the potential problems of postgastrectomy syndromes. These complications may be prevented by preserving the pylorus and duodenal cap at the time of pancreatic resection. Between 1981–1985 we have undertaken the conservative type of pancreatoduodenectomy in 15 patients (eight men, seven women, median age 41 years). The median length of duodenum preserved beyond the pylorus was 3 cm (range 2–6 cm). Indications for operation were chronic pancreatitis (n=9) and localised neoplasia (ampulla three, duodenum one, insulinoma one, bile duct one). One patient died (aged 81 yrs), and two required reoperation for a pancreatic abscess or stenosed cholecdochojejunostomy. Ten of the remaining 12 patients recovered uneventfully but the other two had transient problems with gastric emptying. One patient continued with occasional vomiting despite a normal gastric emptying scan, whilst the other required nasogastric suction for 21 days. The 14 survivors are well at a median follow-up of 1-25 years, although two patients with chronic pancreatitis have needed a coeliac plexus block.

Risk factors in distal pancreatectomy

R B GALLAND, A W HALLIDAY, AND L H BLUMGART (Department of Surgery, Royal Postgraduate Medical School, London) From 1979–1984, 54 pancreatectomies have been carried out, including 20 distal pancreatectomies. Primary pathology was tumour (benign insulinoma three, malignant vipoma three, mixed endocrine tumours three, cystadenoma one and cystadenocarcinoma one), pancreatitis (acute five, chronic two) and trauma (two). Tumours were reliably located pre-operatively by angiography, CT and ultrasound, and pancreatic cysts (three) were accurately defined with CT and ultrasound. Radiological visualisation of the pancreatic duct with ERCP or operative pancreateography confirmed ductal strictures in two cases.

Because the tumours are often large (up to 12 cm diameter) and invading the mesocolon we use pre-operative bowel preparation routinely in case colonic resection is required. Approaching these tumours from below allows easier identification of the vasculature. We prefer to transect the pancreas with a GIA stapler and oversew this with silk. Enteral drainage of the stump, however, was performed in two cases.

Four patients died (two with tumour and two with pancreatitis), all of whom developed intra-abdominal sepsis post-operatively. Three other patients had life threatening complications (pancreatic and intra-abdominal abscess, facal fistula and septicemia). Risk factors predisposing to severe postoperative complications included pre-existing malnutrition (p<0.025), infection (p=0.014) or inflammation of the gland (p=0.016, Fisher’s exact test). Three other patients had short lived pancreatic fistulae which closed spontaneously.

We conclude that distal pancreatectomy can be carried out safely in most cases, and that complications are more likely with pre-existing malnutrition, infection, or diffuse pancreatic inflammation.

Digestive enzymes, lysosomal hydrolases and protease inhibitors in peritoneal fluid of patients with acute pancreatitis: relationship to aetiology

M J MCMAHON, A D MAYER, D A DUBICK, G MAR, A P N MAJUMDAR, M C GEOKAS (University Department of Surgery, General Infirmary, Leeds and Biological Chemistry, University of California, Davis CA, USA) It has been suggested that a trigger mechanism in the pathogenesis of acute pancreatitis (AP) which is independent of aetiology, is activation of zymogen by lysosomal hydrolases within the pancreas. The majority of the exudate from the pancreas probably pools within the peritoneal cavity. Free peritoneal fluid and plasma from 24 patients with acute pancreatitis was studied to investigate the relationship of lysosomal hydrolases (b-glucuronidase and acid phosphatase), secretory enzymes (amylac, cationic trypsinogen, elastase, RNase) and protease inhibitors (α,-protease inhibitor, α,-macroglobulin) to aetiology (gall stone (nine), alcohol (six), idiopathic (nine)).

The trypsin inhibitory capacity was measured using TAME, elastase inhibitory capacity using SLAPNA and trypsin amidase activity using BAPNA.

In all groups, secretory and lysosomal enzyme concentrations in fluid were significantly higher than in plasma, and inhibitory capacity lower. The presence of both trypsin and elastase bound to α-M indicated prior activation of bothzymogens. The aetiology of AP did not appear to have a significant influence upon these changes.

The presence of lysosomal and secretory enzymes in peritoneal fluid, and evidence of activation of pro-elastase and trypsinogen, are consistent with an initiating mechanism, such as the activation of zymogens by lysosomal hydrolases, which is common to different aetiological agents.

Pancreatic pseudocysts and abscesses after acute pancreatitis: report from a multicentre study

M G SHEarer, A P DICKSON, C W IMRIE, A D MAYER, M J MCMAHON, A P CORFIELD, M J COOPER, R C N WILLIAMSON (Department of Surgery, Glasgow Royal Infirmary, Leeds General Infirmary, Bristol Royal Infirmary) From 413 patients with acute pancreatitis...
(AP) thirty two developed a pseudocyst and 18 a pancreatic abscess. Of the 32 pseudocysts (18 men, 14 women) 50% resulted from gall stone induced disease, 15% from alcohol and in 21% the aetiology remained unknown. Twenty nine were diagnosed by ultrasound and/or CAT scan, one at operation, and two at necropsy. Spontaneous resolution occurred in 18 (56%); nine (28%) underwent a drainage procedure, and the remaining five died. There were no deaths in alcohol associated pseudocysts and 80% of these resolved. Only 56% of the gall stone associated abscesses resolved and there were three deaths, giving a 16% mortality for pseudocysts. Of the 18 abscesses the aetiology remained unknown in seven, was alcohol in five, gall stones in five, and postERCP in one. Twelve were diagnosed by ultrasound and/or CAT scan, three at operation, and three at necropsy. Laparotomy and external drainage was done in 13, of whom eight died. Only one survived without surgery. Positive bacteriologically was obtained in 77% from operative specimens. The aetiology was unknown in 58% of the fatalities. The abscess mortality was 67%.

Assessment of disease severity by diagnostic peritoneal lavage or multiple laboratory criteria predicted 35 (70%) patients as severe. Of the rest four (three pseudocyst) died, two with abscesses survived, two with pseudocysts required operation and six with pseudocysts resolved.

Analysis of deaths from acute pancreatitis: disturbing findings.

C WILSON and C W IMRE (Division of Surgery, Royal Infirmary, Glasgow)

Review of pancreatitis deaths at Glasgow Royal Infirmary over the past 11 years revealed 126 patients (62 men, 64 women) with mean age 63+/−15 years. Necropsy and/or laparotomy information was available in 87%. In 53 (42%) patients the diagnosis of pancreatitis was first made at necropsy. A substantial number had presented atypically, often to physicians, and the diagnosis was not considered (Table).

Of the 39 patients with gall stone associated pancreatitis 23 (59%) were found to have stones in the extrapancreatic ducts (common bile duct 19, cystic duct two, impacted at ampulla two). Severe pancreatic destruction (abscess or necrosis) was found more commonly in association with ductal calculi than when calculi were confined to the gall bladder. Surgery was carried out during the final admission in 13 patients shown to have a gall stone aetiology. In six of these patients gall stones were not eradicated at surgery (four of whom did not have stones identified, even with multiple operations). Abnormal LFTs suggesting a biliary aetiology were found in 84% of the 31 patients checked.

It is disturbing that in a major teaching hospital with a particular interest in acute pancreatitis such a large number of patients were diagnosed only at necropsy.

Gall stones giving rise to acute pancreatitis may be difficult to diagnose and can be overlooked at laparotomy. The LFT pattern of results was usually consistent with a biliary aetiology and warrants greater emphasis. Our data suggest that the continued presence of ductal calculi is associated with more severe pancreatic pathology than when calculi are present only in the gall bladder and it is probable that endoscopic sphincterotomy earlier in their illness would have helped a number of these patients.

Effect of phospholipase A2 and lysocleithin on pancreatic duct integrity

C P ARMSTRONG, T V TAYLOR, H B TORRANCE (Department of Surgical Gastroenterology, Royal Infirmary, Manchester) Bile or duodenal reflux into the pancreatic duct leading to damage to the pancreatic duct mucosal barrier may initiate gall stone pancreatitis. Phospholipase A2 (PLA2) and its product lysocleithin are extremely toxic to cell membranes and may play a key role in compromising duct integrity. This study has evaluated the toxic potential of PLA2 and lysocleithin on the previously described model of rat bile—pancreatic duct (BPD) perfusion.

The BPD of rats was perfused at low pressure with a standard solution (SPS) Na+ 150, HCO3- 120, Cl 30 mmol/l) – period I, with the test solution – period II and finally with SPS again – period III. The difference in ion flux (μmol/cm/h) of Cl (AJCl) and HCO3- (AJHCO3-) and transudal potential difference (ΔAPmv) between periods III and I was calculated.

Damage to duct integrity was indicated by an increased ion flux and an altered ΔAP with changes on electron microscopy (em). The test solutions were A, SPS (control); B, 10 mM glyceroxocholate (GDC); C, PLA2 (500 u/l); D, PLA2+GDC, E, 1% lysocleithin; F, lysocleithin+GDC (N=10 for each).

<table>
<thead>
<tr>
<th>Group</th>
<th>Change in ion flux (mean±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ΔAJCl</td>
</tr>
<tr>
<td>A</td>
<td>+0.10±0.01</td>
</tr>
<tr>
<td>B</td>
<td>+0.60±0.13</td>
</tr>
<tr>
<td>C</td>
<td>+0.60±0.60*</td>
</tr>
<tr>
<td>D</td>
<td>+2.41±0.20</td>
</tr>
<tr>
<td>E</td>
<td>+1.66±0.08</td>
</tr>
<tr>
<td>F</td>
<td>+1.89±0.07</td>
</tr>
</tbody>
</table>

*p<0.001 E vs A; p<0.01 D vs C or B; p<0.01 E vs A; p<0.02 F vs E or B

Perfusion with PLA2 (C) produced a significant increase in duct permeability with epithelial swelling and apical vacuolation. The addition of GDC to PLA2 (D) increased duct permeability with pronounced epithelial swelling and vacuolation. Lysocleithin (E) led to increased duct permeability with ultrastructural changes similar to active PLA2 perfusion (D). The addition of GDC to lysocleithin (F) increased duct damage. Thus PLA2 made active by bile salts was very toxic to duct integrity. Lysocleithin alone gave similar changes suggesting an equivalent mode of action.

Lysocleithin and active PLA2 may disturb pancreatic duct integrity and so play a part in the pathogenesis of gall stone pancreatitis.

References

‘Prune juice’ peritoneal fluid in patients with acute pancreatitis: is the pancreas necrotic?

M LARVIN and M J MCMAHON (University Department of Surgery The General Infirmary, Leeds) Ascitic fluid of ‘haemorrhagic’ or ‘prune juice’ colour is a feature of severe acute pancreatitis. The origin of this fluid remains unclear, but when present it is often assumed that pancreatic necrosis must exist. The object of this study was to analyse data from 237 successful diagnostic peritoneal lavages from 446 attacks of acute pancreatitis, in order to assess the strength of the associa-
tion between the ‘prune juice’ and clinically significant necrosis. Diagnostic lavage was carried out as early as possible in the course of the attack using a standardised technique. The volume of free peritoneal fluid, and the depth of colour of both free fluid and the return from a one litre saline lavage, were recorded. Significant necrosis was defined as the presence, at laparotomy or necropsy, of necrotic pancreatic tissue, or the development of a pseudocyst of greater than 5 cm in diameter. Twenty eight patients died, but in eight instances necropsy was not carried out and these cases were excluded from analysis.

If the colour of free and return fluid, and the volume (>40 ml) of free fluid were all considered, necrosis was predicted with a sensitivity of 72%, specificity of 84%, and a 3% false negative rate. Only one third of patients with ‘prune juice’ developed significant pancreatic necrosis of its sequelae.

<table>
<thead>
<tr>
<th>Free peritoneal fluid colour</th>
<th>Necrosis (n=18)</th>
<th>No necrosis (n=211)</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Prune juice’ (n=29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighter colour (n=200)</td>
<td>9 (31%)</td>
<td>20 (69%)</td>
</tr>
</tbody>
</table>

Intragastric acid resistant lipase activity in pancreatic steatorrhoea: comparison with health and effect of a fungal lipase

K BALASUBRAMANIAM, D FACCINNETTI, D BENOLIEL, C BROWN, J C BATTEN, T C NORTHFIELD (Department of Medicine, St George’s Hospital Medical School and Brompton Hospital, London) We have previously reported that some lipolysis occurs in patients with complete pancreatic lipase deficiency due to adult CF. It has been reported that acid-resistant lingual lipase is the predominant intraduodenal lipase in such patients, but they did not carry out a direct comparison with healthy controls. An increase in intragastric activity in CF has been reported but their assay was not specific for lipase. We have therefore specifically assessed lingual lipase activity and percentage lipolysis in gastric aspirate from 10 patients with steatorrhoea due to adult CF (confirmed by sweat test) and from 10 matched healthy volunteers. Because pancreatic lipase is destroyed by gastric acid, we restudied the CF patients after a dose of a fungal lipase (aspergillus niger, 45 000 units). Gastric samples were aspirated for 2 hours follow-

ing a meal of long chain triglyceride in emulsified form. For acid resistant lipase assay we used ‘H-triolein as emulsion at pH 4-2. Lingual lipase activity (mean ±SEM) was twice as high in CF as in controls (596±25 vs 299±28 nmol of free fatty acid released/ml of gastric juice/minute; p=0.04 for area under the curve). In vitro, fungal lipase had a pH optimum of 4-2, a wide pH range and reversible inactivation outside this range. 70% activity was retained during incubation with bile acids at 8-12 mmol/l and the concentration found intraduodenally in CF. In vivo it caused a significant increase in acid resistant lipase activity (p=0.006). We conclude that patients with pancreatic steatorrhoea due to adult CF have a compensatory increase in lingual lipase activity and in intragastric lipolysis; and that fungal lipase is of potential therapeutic value, as it is resistant to acid in vitro and in vivo.

Secretin-ultrasound provocation tests in pancreas divisum

J R LOWES, W R LEES, AND P B COTTON (Departments of Gastroenterology and Radiology, The Middlesex Hospital and University College Hospital, London) It has been suggested that pancreas divisum (PD) predisposes to pancreatitis because of relative stenosis at the accessory papilla. Warshaw has claimed that functional stenosis can be detected by showing dilatation of the (dorsal) pancreatic duct by ultrasound scanning after pancreatic stimulation with secretin. We have done secretin-ultrasound provocation tests in 43 subjects. The pancreatic duct size was measured in the head, body, and tail by ultrasound scanning at five minute intervals for 20 minutes after an intravenous injection of Boots secretin (2 units/kg). Warshaw’s criteria for a positive response were: dilatation of 1 mm or more in two parts of the gland, or of 2 mm in one part. Using these criteria we obtained the following positive results: Pancreas divisum with definite pancreatitis 4 of 9, Pancreas divisum with no evidence of pancreatitis 4 of 15, Abdominal pain with normal ducal anatomy 2 of 10. Healthy volunteers 5 of 9.

We also measured pancreatic enzymes (amylose and lipase) sequentially in the serum during a number of these tests; no consistent patterns emerged. This variety of provocation test appears to be of no value in assessing the relevance of pancreas divisum.

Segmental pancreatitis in pancreas divisum: evidence from surgical specimens

J P LOWES, J RODIE, P B COTTON, A P DILLON, AND R C G RUSSELL (Departments of Gastroenterology and Histopathology, The Middlesex Hospital and University College Hospital, London) Several groups have postulated that the congenital anomaly of pancreas divisum (PD) predisposes to pancreatitis when there is relative stenosis at the accessory papilla. If this is the case, pancreatitis should be segmental—that is, confined to the dorsal part of the gland. We have been able to study resection specimens from 13 patients with PD who had undergone Whipple’s procedure (pancreato-duodeno-ectomy) for pancreatitis. There were three men and 10 women aged 23-65 years (median 40). The ventral and dorsal parts of the gland were identified by injection of the duct systems, and by recognition of their different morphology. Pancreatitis was confined histologically to the dorsal part in nine specimens: in the other four patients (all of whom had a history of alcohol abuse) pancreatitis was also present in the ventral part, but was much less severe. Interpretation of these findings is made difficult by the fact that 11 of the patients had undergone some form of interference at the accessory sphincter, either endoscopic sphincterotomy or surgical sphincterplasty, some months or years before resection. In the two patients who had not undergone previous surgery, we found ectopic pancreatic tissue close to the accessory papilla; this may contribute to stenosis. These observations suggest that pancreatitis may be segmental in patients with pancreas divisum.

Use of CA-50 radioimmunoassay in the differential diagnosis of malignant and non-malignant conditions of the pancreas

N A HABIB, M J HERSHMAN, L LINDHOLM, J HOMGMREN, C B WOOD, AND R C N WILLIAMS (Department of Surgery, Bristol Royal Infirmary, Bristol, UK. Department of Surgery, Royal Postgraduate Medical School, London, UK. Department of Medical Microbiology, University of Göteborg, Göteborg, Sweden) Oncogenic transformation of the cell is accompanied by alteration in cell membrane glycoproteins and by expression of CA-50 oncofetal antigen and its subsequent release into the systemic circulation. Using a radioimmunoassay we have investigated the serum CA-50 concentration...
in 50 normal subjects, nine patients with pancreatitis and 26 patients with histological proof of adenocarcinoma of the pancreas. Serum CA-50 concentrations were below a ‘cut-off’ level of 17 units/ml – that is negative – in all normal subjects and in eight of nine patients with chronic pancreatitis. The remaining patient with pancreatitis had a CA-50 level of 25 units/ml – that is, false positive. Twenty five of the 26 patients with pancreatic carcinoma had sera CA-50 concentrations above 17 units/ml – that is, positive. The mean serum CA-50 value for patients with positive concentrations was 63±43 units/ml (range 20–116).

These preliminary results suggest that serum CA-50 concentration is a tumour marker of considerable potential value in the detection of pancreatic carcinoma. It remains to be seen whether its use as a screening test will detect pancreatic cancer at a curable stage.

Reference
1 Holmgren J, Lindholm L, Lagergard T et al. Detection with monoclonal antibody of carbohydrate antigen CA 50 in serum of patients with carcinoma.

Stimultaneous assessment of CA 19-9 and TPA: a reliable index of pancreatic cancer?

A. Panucci, C Fabris, G Del Faverio, D Bassio, M Plebani, A Burlina, R Naccarato
(Cattedra di Malattie Apparato Digerente, Policlinico Universitario, Via Giustiniani 2, Padova, Italy). In order to assess whether the simultaneous evaluation of CA 19-9 and TPA could improve the results given by the single parameter in pancreatic cancer diagnosis, serum CA 19-9 (immunoradiometric assay, GICAK, Sorin, Italy) and TPA (RIA technique, Proligen, AB Sangtec Medical, Sweden) were determined in 28 control subjects (CS), 29 pancreatic cancer (PC), 26 chronic pancreatitis (CP) and 40 extra-pancreatic diseases (EPD).

Increased concentrations of CA 19-9 and TPA were observed in PC (89±6±11±2 U/ml, 7±4±7±3 U/ml, 3±2±7±3 U/ml respectively) as compared to CS (7±4±7±3, p<0.01) and 6±4±7±3, p<0.01). CP (14±7±2±7, p<0.01 and 78±8±8, p<0.01) and EPD (12±8±1, p<0.01 and 17±4±8±1, p<0.01). In the Table are reported the results of the Youden index in the diagnosis of pancreatic cancer.

We conclude that (1) CA 19-9 was confirmed to be a reliable index of pancreatic cancer, useful in differentiating pancreatic malignancy from other pancreatic and extra-pancreatic diseases; (2) TPA showed a slight improvement in sensitivity with a decrease in specificity in comparison with CA 19-9 (3) The combination of the two indices was able to decisively improve sensitivity, while specificity and accuracy were not substantially different from those given by CA 19-9.

Comparative study of different methods of exocrine management in the transplanted rat pancreas

N P Ingram, M S Nolan, N J Lindsey, P F Boyle, A Herold, S Beck, D N Slater, M Fox (Transplantation Laboratories and Dept of Pathology, Royal Hallamshire Hospital, Sheffield).

The management of exocrine secretions in clinical pancreatic transplantation remains controversial. This study has examined four different methods of exocrine drainage in a streptozotocin induced diabetic rat isograft model.

The pancreatic ductal system was either obliterated with latex rubber solution, allowed to drain freely into the peritoneal cavity, anastomosed to the ureter or drained into a Roux-en-Y loop of jejunum. Two groups of animals acted as non-transplanted controls, diabetic and normoglycaemic. The animals underwent oral and intravenous glucose tolerance testing and insulin studies at one, three, six, and nine months postoperatively. Grafs were examined histologically, some at one month and the remainder at nine months.

All the transplanted groups remained normoglycaemic and had normal oral glucose tolerance tests over the period of study. With intravenous glucose tolerance tests, however, there was a definite difference between groups. The latex obliterated animals and the duct open group had a significant deterioration in glucose tolerance by nine months. In contrast, the duct to ureter drainage group and the Roux loop drained animals had normal glucose tolerance.

Histological studies supported these results with duct to ureter and Roux loop groups showing the best preservation of pancreatic architecture. Latex obliterated and duct open groups developed extensive fibrosis and fatty metaplasia disrupting the islets.

It is concluded that satisfactory exocrine drainage is important in preserving endocrine function in the rat model.

Method for long term successful transplanting of pancreatic islets for diabetes

S M Griffin, D Alderson, and J R Farnond
(Department of Surgery, University, Newcastle upon Tyne). A whole dispersed pancreatic autograft initially corrects the metabolic abnormalities of diabetes in experimental animals. The efficacy of graft preparation can be assessed by implanting smaller proportions of the total tissue obtained. It is important to show that such smaller graft volumes continue to function normally in the long term. In 28 dogs diabetes was induced by total pancreatectomy. Seven (GpI) received 50% and seven (GpII) received 33% of the graft prepared by a previously described method. Seven further dogs were grafted with 33% of a preparation produced by a new method of enzyme perfusion of the pancreatic duct (GpIII). GpIV consisted of seven dogs receiving 33% grafts prepared by serial digestion on a velcro surface. Long term success was defined as fasting euglycaemia for more than one year after transplantation. Early failure was defined as reversion to the diabetic state within three months of implantation and late failure as diabetes recurring within one year of transplantation. Intravenous glucose tolerance tests were carried out on euglycaemic animals at one, three and six months.

<table>
<thead>
<tr>
<th>Method</th>
<th>Initial failure</th>
<th>Early failure</th>
<th>Late failure</th>
<th>Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>GpI (n=7)</td>
<td>1</td>
<td>6</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>GpII (n=7)</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>GpIII (n=7)</td>
<td>2</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>GpIV (n=7)</td>
<td>6</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

GpIII animals that initially became euglycaemic all remained so for more than one year: the other groups did not demonstrate long-term success. Glucose clearance (K) at one, three and six months was significantly better in GpIII animals than in GpI animals. The results confirm that this method of graft preparation using duct enzyme perfusion produces long-term successful islet autografts with only 33% of the tissue obtained. Associated graft function in these animals was shown to be improved.

Reference