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(Accepted 13 May 1983)

Initial experience with indium-111 autologous leucocyte imaging in patients with acute pancreatitis

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Abstract

Indium-111 labelled autologous leucocyte imaging was used to assess severity in 13 patients with acute pancreatitis. All three patients with severe disease as judged by a prognostic factor grading system had a positive result on imaging. A fourth patient with mild disease as judged by prognostic factors had a positive imaging result and 14 days later developed a pseudocyst. There were no false positive or false negative scans. Evidence from three patients suggested that a positive ¹¹¹In-leucocyte imaging result implies substantial fat necrosis.

In this study imaging was as accurate as prognostic factor grading. The technique may be a useful method of separating mild from severe acute pancreatitis.

Introduction

Indium-111 labelled autologous leucocyte imaging is now an established method for locating infection, both within the abdomen and at other sites.¹⁻³ Recent reports suggest that it also accurately assesses the extent of colonic inflammatory bowel disease.^{4,5} To date there is only one report of its use in acute pancreatitis—namely, in patients being investigated for suspected pancreatic abscesses.⁶ We report our experience of the use of ¹¹¹In imaging in patients with acute pancreatitis.

Patients and methods

Thirteen patients were studied prospectively. Seven were women and six men, and their average age was 56 years (range 19-86). The diagnosis of acute pancreatitis was based on the clinical presentation together with a serum amylase activity greater than 1000 IU/l (mean value on admission 3257 IU/l, range 1050-8100 IU/l). Serum amylase measurements were recorded daily until they had returned to normal, and thereafter they were recorded every three days until discharge. In four patients the serum amylase activity had returned to normal three days after admission, in three patients by the fourth day, in a further four patients by day 5, and in the final two patients by day 7.

The severity of the initial attack was assessed using the prognostic factor grading system described by Imrie *et al.*,⁷ as modified for gall stone associated pancreatitis.⁸ Two patients developed hypocalcaemia, with serum calcium concentrations falling below 2.0 mmol/l (8.0 mg/100 ml). Ultrasound examinations were performed in 11 of the patients within five days of admission.

For each patient autologous leucocytes labelled with ¹¹¹In were prepared using ¹¹¹In-hydroxyquinoline (oxine) solution (Amersham International IN 15P), the labelling dose being in the range 10-20 MBq (270-540 µCi). A mean labelling efficiency of 78.5% (range 62-95%) was achieved for all patients studied. In all cases at least one set of images was obtained within 24 hours of administration of the labelled leucocytes. Imaging was performed with the patients supine using a large field of view gammacamera fitted with a parallel hole medium energy collimator and with analyser windows set to accept the 171 and 247 keV gamma photons from ¹¹¹In. At least 400 000 counts per image were collected. Imaging was performed within three days of admission in 12 patients and on day 7 after diagnosis in the remaining patient.

Results

The table shows the aetiology and severity of the condition in the 13 patients and compares the results of ¹¹¹In-leucocyte imaging and abdominal ultrasound. Three patients had severe pancreatitis, and all three had positive ¹¹¹In-leucocyte imaging results (fig 1). A fourth patient (case 8), judged on prognostic factors to have mild disease, had a positive result on ¹¹¹In-leucocyte imaging (fig 2). This patient developed a pseudocyst 14 days after admission.

The remaining nine patients all had mild pancreatitis on prognostic

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Aetiology and severity compared with ultrasound and leucocyte imaging in patients studied prospectively

Case No	Age and sex	Aetiology	Severity	Results of white cell study	Results of pancreatic ultrasound	Complications
1	83 M	Gall stones	Mild	Negative	Not seen*	—
2	79 F	Gall stones	Severe	Positive	Swelling*	—
3	53 F	Unknown	Mild	Negative	Swelling	—
4	20 M	Alcohol	Mild	Negative	Normal	—
5	50 M	Alcohol	Mild	Negative	Swelling	—
6	19 F	Gall stones	Mild	Negative	Normal*	—
7	86 F	Gall stones	Mild	Negative	Normal*	—
8	69 M	Gall stones	Mild	Positive	Swelling*	Pseudocyst
9	23 M	Alcohol	Mild	Negative	Not done†	—
10	56 F	Gall stones	Severe	Positive	Swelling*	—
11	82 F	Unknown	Mild	Negative	Swelling	—
12	42 F	Gall stones	Mild	Negative	Not done‡	—
13	62 M	Alcohol	Severe	Positive	Normal	Acute renal failure

*Ultrasound scan showed gall stones. †Recent outpatient oral cholecystogram normal. ‡Recent outpatient oral cholecystogram showed stones.

FIG 1—Case 10. Woman aged 56 with severe gall stone associated pancreatitis. Anterior view, showing extensive areas of uptake in subhepatic area and central abdomen. At cholecystectomy fat necrosis found around duodenum.

FIG 2—Case 8. Man aged 69 with clinically mild pancreatitis. Anterior view, showing uptake in central abdomen and subhepatic area. Patient developed pseudocyst.

criteria. None had a positive leucocyte study result, all settled without complication, and all were discharged from hospital within 14 days of admission.

Discussion

Assessment of the severity of an attack of acute pancreatitis is important to identify those patients who have the haemorrhagic form of the disease, with its high mortality and morbidity. The presenting clinical features are a poor guide to severity.⁹ Hypocalcaemia,¹⁰ a raised fibrinogen concentration,¹¹ complement activation,¹² and peritoneal lavage¹³ have all been shown to be of value in assessing the severity of pancreatitis. Ranson *et al*¹⁴ and Imrie *et al*⁷ based their assessment of severity on multiple prognostic factors; the criteria of Imrie *et al* have become widely accepted in Britain. We compared severity of the disease as judged by Imrie's modified criteria⁸ with ¹¹¹In-leucocyte imaging. Three patients with severe disease had positive results. A fourth patient with mild disease on the basis of the prognostic factors had a positive ¹¹¹In imaging result three days after admission and later developed a pseudocyst.

Grey scale ultrasound is a useful method of detecting gall stones but provides no additional information in the early stages of the disease.¹⁵ In our study six patients with gall stone associated pancreatitis had their stones detected by this method.

One major problem with any comparative study is the definition of mild and severe disease in the presence of a wide range of clinical manifestations. Any definition is arbitrary but the aim of prediction in acute pancreatitis is to identify those patients who will develop complications or who will have a protracted clinical course. By using the clinical criteria suggested by McMahon *et al*¹³—namely, more than 14 days in hospital or the presence of a severe complication—all four patients with positive ¹¹¹In imaging results had severe disease. No false

positive or false negative ¹¹¹In images were found compared with a 53% false positive rate and a 23% false negative rate for multifactorial assessment in one recent study¹¹; the numbers in our study, however, were small.

What does a positive ¹¹¹In imaging result mean? In case 13 computed tomography was carried out 24 hours after radio-nuclide imaging and showed the presence of extensive fat necrosis in areas corresponding to those showing increased leucocyte uptake on the indium image. Extensive fat necrosis was also noted in cases 8 and 10 at subsequent cholecystectomy. We believe that a positive ¹¹¹In imaging result implies severe fat necrosis.

From our initial experience it seems that ¹¹¹In-leucocyte imaging is a simple, non-invasive technique for assessing severity early in the course of acute pancreatitis. Its accuracy is similar to that of prognostic factor grading. Further studies using serial imaging are needed to define more precisely the fate of fat necrosis in acute pancreatitis.

We thank Mr G W Johnston, Mr W Wilson, Mr S T D McKelvey, and Professor T G Parks for allowing us to study patients under their care, and Miss S Campbell for typing the manuscript.

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(Accepted 21 June 1983)