Evaluation of indium scintigraphy in patients with active inflammatory bowel disease

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SUMMARY Recent reports have indicated a possible role for $^{111}$Indium leucocyte scintigraphy in the management of patients with acute inflammatory bowel disease. Our experience with this technique in 15 patients (nine with ulcerative colitis, six with Crohn's disease) is described. Perfect agreement was not obtained between scintigraphic appearances and other conventional means in the assessment of extent of disease. Good correlation, however, was found between disease activity and recovery of labelled leucocytes in the faeces. While this latter finding could be used as an objective means of assessing response to therapy, it is concluded that conventional indium scintigraphy, using indium oxine-labelling of mixed leucocytes, is insufficiently reliable to replace usual methods for determining extent of disease in patients with inflammatory bowel disease.

Recent reports from the UK$^1,2$ and USA$^3$ have indicated a possible role for $^{111}$Indium leucocyte scintigraphy in the management of patients in exacerbation of chronic inflammatory bowel disease. The migration of labelled leucocytes to the areas of active inflammation enables scintigraphic estimation of the extent of the disease while its severity is related to the proportion of the leucocyte label which is shed in the faeces. This report describes the findings in our evaluation of the technique.

METHODS

PATIENTS
Fifteen consecutive inpatients who were admitted in exacerbation of chronic inflammatory bowel disease were included in the study. Each gave informed consent to the intended investigation. Six patients had Crohn's disease and nine had ulcerative colitis diagnosed according to conventional criteria.

SEVERITY OF DISEASE
Disease severity was estimated on admission of the patient to hospital according to the criteria of Truelove and Witts$^4$ or the Crohn's disease activity index (CDAI).$^5$

EXTENT OF DISEASE
The results of the four hour $^{111}$Indium scintigrams were compared with those obtained by conventional radiological or endoscopic techniques or, in some instances, by inspection of resected specimens. No attempt was made to correlate scintigraphic findings with histological appearances and the comparisons were based on the gross macroscopic or radiological appearances only (Table). In two patients (no 4 and 11, Table) limited colonoscopy was performed because of the severity of their disease. In each instance the colonoscope was passed to the splenic flexure and it was only possible therefore to confirm left sided disease in these patients. Although the disease might have extended further for the purposes of comparison it was assumed that the disease did not extend proximal to the splenic flexure. One patient (patient 1, Table) did not have conventional assessment during her admission. In this instance it was assumed that the disease was restricted to the left hemicolon as had been shown in four previous barium enemas and was reconfirmed in a subsequent outpatient examination.

TREATMENT RECEIVED
All the patients were given active treatment on admission to hospital which included replacement of...
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Table  Clinical details of patients

<table>
<thead>
<tr>
<th>No</th>
<th>Diagnosis</th>
<th>Extent of disease</th>
<th>Test used and days post scint</th>
<th>Indium scintigram</th>
<th>Activity in stools (%)</th>
<th>Severity of disease</th>
<th>Treatment at time of scintigram (days)</th>
<th>Treatment (Pred)</th>
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<tbody>
<tr>
<td>1</td>
<td>CD</td>
<td>Patchy, L sided</td>
<td>Barium enemas*</td>
<td>Negative</td>
<td>1-7</td>
<td>CDAI=421</td>
<td>5</td>
<td>10 mg</td>
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<td>2</td>
<td>CD</td>
<td>Total</td>
<td>Colectomy 11</td>
<td>Total</td>
<td>26-5</td>
<td>Severe</td>
<td>6</td>
<td>40 mg</td>
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<tr>
<td>3</td>
<td>UC</td>
<td>Total</td>
<td>Barium enema 14</td>
<td>Total</td>
<td>18-4</td>
<td>Severe</td>
<td>4</td>
<td>40 mg</td>
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<td>4</td>
<td>UC</td>
<td>≥L sided</td>
<td>Colonoscopy 13</td>
<td>L sided</td>
<td>61</td>
<td>Severe</td>
<td>&gt;14</td>
<td>30 mg</td>
</tr>
<tr>
<td>5</td>
<td>CD</td>
<td>R sided with perianal fistulae</td>
<td>Colectomy 14</td>
<td>Rectal</td>
<td>2-8</td>
<td>Severe</td>
<td>0</td>
<td>Bowel/rest TPN</td>
</tr>
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<td>L sided</td>
<td>Colonoscopy 1</td>
<td>L sided</td>
<td>10</td>
<td>Severe</td>
<td>&gt;14</td>
<td>30 mg</td>
</tr>
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<td>7</td>
<td>UC</td>
<td>Total</td>
<td>Barium enema 5</td>
<td>Total</td>
<td>24</td>
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<td>7</td>
<td>40 mg</td>
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<tr>
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<td>L sided</td>
<td>Colonoscopy 6</td>
<td>L sided</td>
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<td>Severe</td>
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<td>9</td>
<td>UC</td>
<td>Total</td>
<td>Barium enema 4</td>
<td>Caecum</td>
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<td>10</td>
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<td>10</td>
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<td>R sided</td>
<td>Barium enema 8</td>
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<td>Colonoscopy 2</td>
<td>R sided</td>
<td>—</td>
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<td>&lt;14</td>
<td>10 mg</td>
</tr>
<tr>
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<td>CD</td>
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<td>Barium enema 12</td>
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</tr>
<tr>
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<td>UC</td>
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<td>Colonoscopy 1</td>
<td>Focal</td>
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<td>Severe</td>
<td>&gt;14</td>
<td>10 mg</td>
</tr>
<tr>
<td>14</td>
<td>CD</td>
<td>Terminal ileum</td>
<td>Surgery 10</td>
<td>Terminal ileum</td>
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</tr>
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<td>UC</td>
<td>Total</td>
<td>Barium enema 9†</td>
<td>Rectal</td>
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<td>Severe</td>
<td>&gt;14</td>
<td>40 mg</td>
</tr>
</tbody>
</table>

* Barium enemas performed before and after this exacerbation showed left sided disease.
† Subsequent colectomy showed no evidence of disease proximal to the sigmoid colon.
Pred = Prednisolone. ED = Element Diet. TPN = Total Parenteral Nutrition.

Results

Fifteen patients were studied and details are given in the Table. Stool activity was counted in 14 of the 15 patients and was greater than 2% in all but one instance thus confirming disease activity.¹ Scintigraphic agreement was obtained in nine patients (see Fig. 1). The scintigrams, however, underestimated the gross extent of disease in six instances (Fig. 2).

In one patient (no 15) in whom there was a marked discrepancy between the scintigraphic and radiological findings subsequent colectomy showed no evidence of disease proximal to the sigmoid colon in spite of prior radiological evidence to the contrary.

Discussion

These results show that while the recovery of labelled leucocytes in the faeces reliably correlates with conventionally derived indices of disease activity in patients with active ulcerative colitis or Crohn's disease, indium scintigraphy is not an entirely reliable method of estimating disease extent. The failure to obtain correlation between conventional and scintigraphic means might be explicable either by the effect of steroid therapy on the kinetics of the ¹¹¹Indium labelled white cells or by therapeutic reduction of the disease activity.² In
scintigraphy cannot be entirely relied upon to give an accurate assessment of the disease extent. Our data, however, confirm that the recovery of leucocytes from the faeces may provide a reliable quantitative estimate of disease activity although it is notable that indium labelling is no more accurate in this regard than the conventional clinical criteria on which therapeutic decisions will depend.

New labelling techniques, however, have since been developed using indium acetyl acetonate and indium tropolionate. Comparisons have shown that labelling either crude or pure granulocytes in plasma with $^{111}$In could be an effective way to assess disease extent and may indeed supersede conventional criteria for accurate assessment.

Indium scintigraphy is expensive with long labelling procedure and our findings show that it is insufficiently reliable to replace conventional methods of clinical assessment. While it has research interest and may provide objective means of assessing response to therapy, it has no advantages to warrant its routine use in patients with inflammatory bowel disease.

**Fig. 1** Four hour indium scintigram showing total colitis (Patient no 3).

this regard it is notable that of the discrepant scintigrams two were in patients with low stool counts and it might be that these results related to low disease activity in spite of clinical evidence of active disease. This explanation alone, however, would not account for the other discrepant results nor can the effects of steroids be necessarily implicated in view of the positive scans obtained in the other patients on high dose steroids. Notwithstanding any theoretical explanation for our results if indium scintigraphy is to assume a place in the management of the patient with ulcerative colitis or Crohn's disease, it will have to prove itself reliable in those acutely ill patients receiving active therapy.

Although the previous studies of indium scintigraphy have reported good results they have also failed to obtain correlation between the scintigraphic and conventional means of assessment of extent of disease in all the patients. These results taken with those reported here show that indium...
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Fig. 2  (a) Four hour indium scintigram showing focal activity at splenic flexure (Patient no 13). Colonoscopy showed inflammatory polyposis at this site and active colitis distally. (b) Barium enema from the same patient showing a left sided colitis.

References

6 Amersham Int. plc 1983 Indium (111In) Oxine solution for cell labelling.