European evidence-based consensus on the use of imaging techniques in inflammatory bowel disease diagnosis and management

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THE EUROPEAN SOCIETY OF GASTROINTESTINAL AND ABDOMINAL RADIOLOGY

As a European Subspecialty Society, ESGAR is an institutional member of the European Society of Radiology (ESR).
Is the largest forum for specialists in IBD in the world

United European Gastroenterology Federation (UEG) and United European Gastroenterology Week (UEG Week).
The European Association of Nuclear Medicine (EANM) is the umbrella organisation of nuclear medicine in Europe
Independent society

part of the ESR

Infection Committee
CONSENSUS STRATEGY

1.- The consensus organizing committee identified 7 main topics on the use of imaging in IBD.
2.- The working groups performed a systematic literature search using Medline/Pubmed and the Cochrane database, as well as their own files.
3.- Revised statements on their topic were then written by the Chairs, based on answers from their working party, as well as the literature evidence and were circulated first among their working party and then among all participants.
4.- All working groups met in Vienna on 2012 to the final version of each statement. Consensus was defined as agreement by > 80% of participants.
5.- The final document on each topic was written by the Chairs in conjunction with their working party.
### Oxford Centre for Evidence Based Medicine (2011)

<table>
<thead>
<tr>
<th>Level</th>
<th>Individual study</th>
<th>Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Systematic review (SR) with homogeneity of Level 1 diagnostic studies</td>
<td>Systematic review (SR) with homogeneity of randomised controlled trials (RCTs)</td>
</tr>
<tr>
<td>1b</td>
<td>Validating cohort study with good reference standards</td>
<td>Individual RCT (with narrow Confidence Interval)</td>
</tr>
<tr>
<td>1c</td>
<td>Specificity is so high that a positive result rules in the diagnosis (&quot;SpPin&quot;) or sensitivity is so high that a negative result rules out the diagnosis (&quot;SnNout&quot;)</td>
<td>All or none</td>
</tr>
<tr>
<td>2a</td>
<td>SR with homogeneity of level &gt;2 diagnostic studies</td>
<td>SR (with homogeneity ) of cohort studies</td>
</tr>
<tr>
<td>2b</td>
<td>Exploratory cohort study with good reference standards</td>
<td>Individual cohort study (including low quality RCT; e.g., &lt;80% follow up)</td>
</tr>
<tr>
<td>2c</td>
<td>SR with homogeneity of 3b and better studies</td>
<td>&quot;Outcomes&quot; research; ecological studies</td>
</tr>
<tr>
<td>3a</td>
<td>Non-consecutive study; or without consistently applied reference standards</td>
<td>SR with homogeneity of case–control studies</td>
</tr>
<tr>
<td>3b</td>
<td>Case–control study, poor or non-independent reference standard</td>
<td>Individual case–control study</td>
</tr>
<tr>
<td>4</td>
<td>Expert opinion without explicit critical appraisal, or based on physiology, bench research or &quot;first principles&quot;</td>
<td>Case-series (and poor quality cohort and case–control studies)</td>
</tr>
</tbody>
</table>

### Grades of recommendation

- **A**: Consistent level 1 studies
- **B**: Consistent level 2 or 3 studies or extrapolations from level 1 studies
- **C**: Level 4 studies or extrapolations from level 2 or 3 studies
- **D**: Level 5 evidence or troublingly inconsistent or inconclusive studies of any level
15 delegates of each society worked for almost 2 years in 7 different groups

Nuclear Medicine was incorporated in the last decisory meeting
SGAR-ECCO-EANM consensus

CONSENSUS

21 VOTES
Inflammatory bowel disease
Role of labelled WBC scintigraphy

1.- Is it an IBD
2.- Is it CD or UC
3.- Is SPECT necessary
4.- Is late scan necessary
5.- Is the test able to identify small bowel disease
6.- What happens in rectal disease
7.- Does the test provide accurate information on disease extension
8.- Can the test be applied in children
9.- Is the attack mild, moderate or severe
10.- Is able to evaluate response to therapy
- **WG1.** General principles. Technical aspects. Radiation safety
- **WG2:** Upper GI tract & small bowel
- **WG3:** Colon and rectum, CD and UC excluding cancer.
- **WG4:** Perineum including anus, genital tract.
- **WG5:** Liver and biliary tract.
- **WG6:** Special situations: Emergency situation (acutely ill patients to be investigated)
- **WG7:** Special situations nor emergencies: postsurgery, cancer surveillance, ileoanal pouch
• **WG1. General principles. Technical aspects. Radiation safety**

• **WG2: Upper GI tract & small bowel**

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MRI of the small bowel and colon requires fast imaging techniques and luminal distension [EL 2]

MR enterography /enteroclysis has similar diagnostic accuracy and similar indications to CT, but with the major advantage of not imparting ionising radiation [EL 1]

2E. - NM procedures especially WBC scintigraphy are an alternative to cross-sectional imaging for evaluation of disease activity and extent in specific situations (EL2).

Radiation exposure is the major limitation (EL2).

PET/CT with FDG is poorly specific for inflammation and for assessing disease activity (EL3).

2I. - CT, US and SBFT are generally more available and less expensive than MRI and scintigraphy (EL4).
ISORBE
molecular imaging of atherosclerosis, thrombosis, inflammation and infection
Radiation
Dabritz et al. EJGH 2011

- 45 children
- 35 CD, 10 UC
- 18F-FDG PET & low dose CT
- Radiation:
  - 0.1 mSv scout
  - 1.9 mSv low dose CT
  - 5 mSv 18F-FDG
<table>
<thead>
<tr>
<th>EXAM</th>
<th>DOSIS mSv</th>
<th>THORAX Rx EQUIVALENCE</th>
<th>NATURAL RADIATION</th>
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<tbody>
<tr>
<td>Bone scan</td>
<td>8,8</td>
<td>352</td>
<td>3,86 years</td>
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<tr>
<td>MYOCARDIAL PERFUSIONSPECT</td>
<td>5,08</td>
<td>203</td>
<td>2,2 2years</td>
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<tr>
<td>LUNG SCAN (V)</td>
<td>0,6</td>
<td>24</td>
<td>96 days</td>
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<tr>
<td>LUNG SCAN (P)</td>
<td>2,64</td>
<td>105</td>
<td>423 days</td>
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<tr>
<td><strong>99mTc-WBC SCAN</strong></td>
<td><strong>2,4</strong></td>
<td><strong>98</strong></td>
<td><strong>390 days</strong></td>
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<tr>
<td>PET-18F-FDG</td>
<td>7,8</td>
<td>312</td>
<td>3,4 years</td>
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<tr>
<td>BRAIN SPECT (P)</td>
<td>8,14</td>
<td>326</td>
<td>3,57 years</td>
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<tr>
<td>THYROID SCAN</td>
<td>2,88</td>
<td>115</td>
<td>460 days</td>
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<tr>
<td>SEHCAT</td>
<td>0,26</td>
<td>10</td>
<td>40 days</td>
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<tr>
<td>MUGA</td>
<td>2,29</td>
<td>92</td>
<td>366 days</td>
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<tr>
<td>SENTINEL NODE (breast)</td>
<td>0,83</td>
<td>33</td>
<td>133 days</td>
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<tr>
<td>CT (thorax)</td>
<td>6,8</td>
<td>272</td>
<td>2,7 years</td>
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<tr>
<td>CT (Abdomen)</td>
<td>12</td>
<td>480</td>
<td>4,86 years</td>
</tr>
</tbody>
</table>
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3A. SBE, SBFT, US, CT, MRI and WBC scintigraphy are able to detect signs of Crohn’s disease [EL 1], and MRI have a high and comparable diagnostic accuracy at the initial presentation of terminal ileal CD. [EL1]. SBE and SBFT have an acceptable accuracy for mucosal disease but are less accurate for mural disease and extramural complications. [EL3]

3B. US, CT, MRI and WBC scintigraphy can be used to assess disease activity in Crohn’s disease of the terminal ileum [EL1]. MRI; CT and WBC scintigraphy are able to explore the entire length of the small bowel whereas US has a more limited coverage. [EL4]

3C. US, CT and MRI and SBE SBFT have a high sensitivity and specificity for the diagnosis of stenosis affecting the small bowel [EL 2].

Diagnostic accuracy of MRI and CT for stenosis is based on the use of luminal contrast. In partially obstructing stenosis, enteroclysis may provide higher sensitivity than enterography [EL 2].

Cross-sectional imaging using CT, US, MRI [EL 2] and WBC scintigraphy [EL 3] may assist in differentiating between predominantly inflammatory or fibrotic strictures [EL 5].

3D. US, CT, and MRI have a high accuracy for the assessment of penetrating complications (i.e., fistula, abscess) [EL 1] and for monitoring disease progression [EL 4].

For deep-seated fistulas MRI and CT are preferable to US [EL 4].

US and CT are widely available and facilitate early abscess drainage [EL 4].

WBC scintigraphy may provide useful information when cross-sectional imaging is inconclusive for detecting abscesses [EL 3].
Whole bowel exam

51 y/o man.
1 month CD
Endoscopy: Pancolitis.
Small bowel disease

99mTc-HMPAO-WBC
30 y, male
3rd exam
Pancolitis

Early

late
**IBD**: distribution follows the bowel shape
Early image shows uptake

**No IBD**: distribution is focal.
Early image may be almost normal
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4B. The performance of imaging depends on the type of colitis and severity (EL1b). Transabdominal US and MRI have a high accuracy for assessing the activity and severity of Crohn’s colitis [EL:1b, RG:A]; the performance in UC is less clear. The role of CT for distinguishing quiescent from active colonic IBD is currently not defined. White blood cell scintigraphy can detect colon inflammation and can be used as an additional technique (EL2).
Rectal disease

Importance of caudo-cranial (sitting) view
PROCTITIS
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8A. US, CT, MRI, SBFT and WBC scintigraphy detect recurrence of CD after ileocolonic resection and are complementary to endoscopy (EL2). US, CT, MRI, SBFT and WBC scintigraphy can be useful as a follow-up method in patients after small bowel surgery (EL2).
37 old man. 10 days UC
Rectoscopy: UC

Patient remained asymptomatic during the follow-up (1 year)
Inflammatory bowel disease
Role of labelled WBC scintigraphy

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Indications

Diagnostic
- Extent of active disease
- Disease activity

Follow-up
- Early evaluation of therapy efficacy
- Prediction of disease relapse

Complications
- Stenosis: Fibrosis vs relapse

The role of SPECT and PET deserves further evaluation.
Puig et al 2012
HUB

<table>
<thead>
<tr>
<th>33/44 (75%) SPECT modified results</th>
<th>33 extent</th>
<th>24 increases</th>
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<tbody>
<tr>
<td></td>
<td>9 decreases</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 increases</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 decreases</td>
<td></td>
</tr>
</tbody>
</table>

3 patients SPECT change from normal to positive
Gotthardt et al. JNM 2010
18F-FDG. Ulcerative colitis
Questions to answer: PET
Groshar et al J. Nucl. Med. 2010

• 28 CD pat.
• 22 had 85 abnormal segments
• 6 had no abn. Seg.
• SUV max: 5.0 ± 2.5 vs 2.1 ± 0.69
Dabritz et al. EJGH 2011

45 children
35 CD, 10 UC
18F-FDG PET & low dose CT

<table>
<thead>
<tr>
<th>Endoscopy</th>
<th>Positive</th>
<th>Negative</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>PET</td>
<td>PET-CT</td>
<td>All</td>
</tr>
<tr>
<td>Positive</td>
<td>21</td>
<td>12</td>
<td>33</td>
</tr>
<tr>
<td>% of PET/CT</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>% of endoscopy</td>
<td>100</td>
<td>92</td>
<td>94</td>
</tr>
<tr>
<td>Negative</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>% of PET/CT</td>
<td>0</td>
<td>50</td>
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</tr>
<tr>
<td>% of endoscopy</td>
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<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>13</td>
<td>34</td>
</tr>
<tr>
<td>Sensitivity (%)</td>
<td>100</td>
<td>92</td>
<td>97</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
IBD: diagnostic and management flow-chart

- **Is it an IBD?**
  - Endoscopy and MRI
    - Non diagnosis
      - SBFT or CT or WBC
    - Diagnosis
      - What is the extent and activity?
        - MRI and WBC
        - Are there complications?
          - MRI or CT
      - What is the severity and prognosis?
        - WBC and MRI
  - Therapy

- **Does patient respond to therapy?**
  - MRI or WBC

- **What is the probability to relapse?**
  - WBC
Thank you