Scintigraphy of Gastrointestinal Tract Haemorrhage

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1. Introduction

^{99m}Tc labelled erythrocytes is administered to patients with gastrointestinal tract (GI) bleeding of unknown location in order to obtain images of the extravasation of the radiopharmaceutical into the bowel. The aim of this investigation is to determine whether the patient is actively bleeding at the time of the investigation and, in the event of a positive scintigram to provide information required for arteriography or surgical intervention. In some patients, the bleeding site is identified with sufficient accuracy using scintigraphy alone. Localisation is only possible if the extravasate itself and its subsequent dissemination in the bowel are visualised by imaging. Theoretically, ^{111}In labelled erythrocytes can also be used, but results in poorer images. ^{99m}Tc colloid can be used if injected during bleeding, which is rarely the case. Also, late imaging of colloid is not possible.

2. Methodology

This guideline is based on available scientific literature on the subject, the previous guideline (Aanbevelingen Nucleaire Geneeskunde 2007), international guidelines from EANM and/or SNMMI if available and applicable to the Dutch situation.

3. Indication

Recurrent intermittent (GI) bleeding of unknown origin in which endoscopy or other investigations are negative. A successful investigation is most likely in patients needing a blood transfusion of at least 500 ml in the 24 h prior to the examination. It is not usually possible to show lighter bleeding of less than 0,5 ml/min or if the patient requires 2-3 transfusions per week.

4. Relation to other diagnostic procedures

The examination can be started soon after it is requested. Subsequent endoscopy and/or arteriography is essential in the event of a positive scintigram in order to achieve the best results.

5. Medical information necessary for planning

a. Case history, particularly a note of when melaena or rectal blood loss last occurred.
b. Transfusion requirements.
c. Recent vital signs: blood pressure, pulse.
d. Endoscopy results
e. Results of radiological investigations

6. Radiopharmaceutical

Tracer: ^{99m}Tc autologous erythrocytes (after pretinning). The labelling percenta-

	ge should be at least 90 to 95% given the significant interference from background activity. For this reason, the in vitro labelling method is preferable.
Warning:	it is essential to be aware of the risk of mixing up blood between patients during ex-vivo labelling procedures.
Nuclide:	Technetium-99m
Activity:	750 MBq
Administration:	Intravenous
Labelling:	In principle, in-vivo, in-vitro or semi-in-vitro ('in-vivtro' method) labelling is possible. See radiopharmacy part III.

7. Radiation safety

a. Pregnancy

The external radiation dose received by the foetus after intravenous administration of the radiopharmaceutical to the mother will be approximately 2,295 mGy (0,0039 mGy/MBq). For this investigation foetal risks will therefore be low. If endoscopy is inconclusive, and a strong suspicion for gastrointestinal bleeding persists, scintigraphy during pregnancy can be considered.

b. Lactation

Breast feeding should be interrupted for 12 h after in vivo labelling and after in vitro labeling there is no need to interrupt breastfeeding, but due to possible free ^{99m}Tc pertechnetate it is advisable to interrupt the feeding for 4 h.

c. Effective dose (mSv/MBq)

0,039; 0,021; 0,014; 0,0089; 0,0070 for respectively a 1-yr, 5-yr, 10-yr, 15-yr old and an adult patient with a normal biological functioning.

8. Patient preparation/essentials for the procedure

Patient preparation

1. Since scintigraphic detection of bleeding is an acute investigation, patient preparation is generally not possible.
2. As with angiography, this investigation is hindered by the presence of contrast media from radiological examination of the colon, which should therefore be avoided in these patients.
3. Heparinisation may be used to provoke bleeding in certain circumstances (long-term medical history, several previous negative scintigrams and angiography). This does require hospitalization.
4. It is important that patients with active bleeding are observed during the investigation (1-8 h).

Essentials for the procedure

No special requirements; a sphygmomanometer, infusion system and extra blood etc. may be needed depending on the clinical situation.

9. Acquisition and processing

a. Following patient registration, it is important that the investigation commences as soon as possible if active bleeding is suspected. Any delay will reduce the chance of

success in detecting intermittent bleeding.

b. The investigation proceeds for 6 to 8 hours after which the need for further imaging should be discussed with the requesting physician/ surgeon.

c. The images are evaluated at fixed times during the examination in order to detect any bleeding as early as possible and to allow for discussion with the requesting physician with regard to follow-up examinations such as arteriography or endoscopy.

d. Any further investigations should be arranged as quickly as possible in the event of a positive scintigram.

e. Camera settings and processing:

Energy:	^{99m}Tc setting, 140 keV
Window:	15-20%
Collimator:	LEAP
Counting time:	Where indicated, proceed as described below. Obtain dynamic images (anterior) with 1 min frames for 60 min starting immediately after injection. Subsequently, where indicated, obtain one 5-min image every hour. If changes are seen on the image or if there is clinical suspicion of active bleeding, switch back to 1-min dynamic images for 15-30 min in order to determine the primary localisation based on the pattern of movement. Both antegrade and retrograde movement of activity may be seen. It is important to include the entire abdomen in the field of view. It is not generally useful to continue with the examination if it is still negative after 6 to 8 h. The colon is often visible on scintigrams obtained the following day. Conclusions regarding localization are no longer possible due to the transport of activity. It is, however, possible to determine whether bleeding has occurred in the last 24 h.
Computer:	128×128 matrix

10. Interpretation

a. If the scintigram is positive, this is usually seen within 4 h following injection of labelled erythrocytes. The examination is positive if abdominal accumulation is seen which increases in intensity over time, and which is transported intraluminally in antegrade or retrograde direction.

b. The investigation must be evaluated in cine format as the source of bleeding can be missed on the individual images due to a rapid peristalsis in both the large and small intestine.

c. Recurrent intermittent gastrointestinal bleeding for which no cause has been found using other modalities, is usually due to angiodysplasia or possibly a large bowel tumour. Bleeding may also originate in the small intestine although this occurs less frequently.

d. Information on individual bowel anatomy gained from previous radiological examinations can prove very useful for reporting due to the significant individual differences that exist in the anatomical course of the bowel.

e. Excretion of activity into the kidneys and the ureters must be taken into account. It may be useful to ask the patient to empty his/her bladder since urine activity can mask rectal bleeding.

f. Investigations using ^{111}In labelled erythrocytes allow for longer imaging although it is important to obtain images every hour. Imaging intervals of longer than 1 h make evaluation of the original localization impossible. It is useful to obtain late images the following day if the original scintigrams are negative.
g. A negative investigation does not exclude intermittent bleeding but indicates that there was very little or no bleeding during the investigation (24 h). Negative investigations may be repeated if there is a continued transfusion requirement, or a clinical indication of active bleeding.

11. Report

The report should describe the primary location of bleeding as accurately as possible based on initial uptake and movement of activity to provide information required for potential further investigation.

12. Literature

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