Hepatic Haemangioma Scintigraphy

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1. Introduction

Haemangiomas are the most common benign tumours of the liver. Often, they are incidental findings. Most frequently they are diagnosed on liver (contrast enhanced) ultrasound (US), multiphase computed tomography (CT) or magnetic resonance imaging (MRI). When these techniques are inconclusive, hepatic haemangioma scintigraphy with labelled erythrocytes can be performed. Liver haemangiomas can be recognised since they typically show decreased or equal perfusion compared to the surrounding liver parenchyma, while the erythrocyte concentrations is increased compared to the surrounding liver tissue for at least 2 h after administration of the labelled erythrocytes. On the other hand, compared to the liver, metastases have a similar flow pattern and equal blood-pool activity. Hepatomas may also show increased blood-pool activity, but generally show increased perfusion.

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. Indications

Space occupying lesions in the liver diagnosed by US, CT or MRI, when optimal differentiation between haemangioma and a space occupying lesion of a different type is not possible. Scintigraphy is indicated when biopsy of the haemangioma is not without risk.

4. Relation to other diagnostic procedures

It is essential to compare the scintigraphic data with the US, CT and MRI. Haemangiomas show a classic pattern on 50-80% of CT's, and on 50% of ultrasounds. MRI is more sensitive for smaller lesions (< 1 cm).

5. Medical information necessary for planning

Knowledge of the exact localisation and size of the suspect lesion is required for optimal interpretation of the investigation. The detection limit of a haemangioma by scintigraphy is approximately 1,5 cm.

6. Radiopharmaceutical

Tracer:	^{99m}Tc autologous erythrocytes (after pre-tinning)
Nuclide:	Technetium-99m
Activity:	500 MBq
Administration:	Intravenous

7. Radiation safety

a. Pregnancy:
The external radiation dose received by the foetus after oral administration of the radiopharmaceutical to the mother is approximately 1,95 mGy (0,0039 mGy/MBq). The investigation should be postponed till after parturition whenever possible.

b. Lactation
Breast feeding should be interrupted for 12 h after in vivo labelling and there is no need to interrupt after in vitro labeling, but due to possible free ^{99m}Tc pertechnetate it is advisable to interrupt the feeding for 4 h, according to ICRP 106.

c. Effective dose (mSv/MBq)
0,039; 0,021; 0,014; 0,0089 and 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

Erythrocyte pretinning: 10 min prior to blood collection, a tin-fluoride or tin-chloride solution containing 10-20 µg/kg body weight of tin ions is administered intravenously. This is followed by the collection of 5 ml of blood in citrate buffer (ACD) and subsequent labelling with ^{99m}Tc pertechnetate (see Scintigraphy of Gastrointestinal Tract Haemorrhage, pag 304).
Labelling can in principle take place in-vivo, in-vitro or semi-in-vitro. It is important for imaging quality to ensure that a high labelling percentage is achieved (90-95%).

9. Acquisition and processing

a. Start with a flow study in the view which is expected to best visualise the lesion (depending on the localisation based on previous imaging modalities).
b. Two hours post tracer administration, obtain 5 min static anterior, posterior and right-lateral images of the liver, optionally supplemented with oblique images.
c. SPECT increases the sensitivity of the examination, in particular for the detection of small (1-2 cm) and centrally located abnormalities. If possible, a combined SPECT/CT investigation is recommended.
d. Camera settings and processing:

Energy:	^{99m}Tc setting, 140 keV
Window:	15-20%
Collimator:	LEAP or LEHR, for SPECT: LEHR
Counting time:	Flow study: dynamic images of 5 sec per image over a period of 1 min. Some centres recommend dynamic images of 1 sec over a period of 1 min, followed by twenty-four images of 1 min per image. 2 h after injection obtain static images of 5 min per view (or 750-1000 kcounts per image)
Computer:	Flow study: matrix 64×64. Static images: matrix 128×128
SPECT images:	60 views of 20 sec in one rotation of 360°, matrix 64×64

10. Interpretation

a. In the flow study, haemangiomas initially show decreased perfusion compared to

normal liver tissue, with accumulation taking place in the following hours. The lesions thus appear as hot spots 2 h later. Abnormalities other than haemagiomas generally demonstrate a different pattern. However, there are case reports of lesions with the typical haemangioma pattern which are later shown to have another cause.

b. It should be taken into account that planar images are less sensitive than SPECT images and that the sensitivity decreases with lesion size. The sensitivity of SPECT images is approximately 100% for abnormalities > 1,5 cm; the specificity of SPECT haemangioma scintigraphy is approximately 100%.

c. Fibrosis or thrombosis can occur in a haemangioma, which can cause most of the classic pattern of blood-pool hyperactivity to disappear. This can cause a false-negative result.

11. Report

State the number of lesions as well as their localisation and intensity relative to the surrounding liver tissue. Compare the results with the ultrasound, CT or MRI findings.

12. Literature

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