

# Spleen Scintigraphy Using Denatured Erythrocytes

JF Verzijlbergen, Erasmus MC, Rotterdam  
 JP Esser, Meander Medical Centre, Amersfoort

*NOTE: no changes have been made since the version of 2007*

## 1. Introduction

The use of  $^{99m}\text{Tc}$ -labelled denatured erythrocytes allows the spleen to be imaged selectively without interference from radioactive uptake in the liver.

## 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

- a. Suspected rupture of the spleen following blunt abdominal trauma.
- b. To detect functional spleen tissue in patients with recurrent idiopathic thrombocytopenic purpura following splenectomy.
- c. To evaluate the function of the spleen following spleen tissue implantation.

## 4. Relation to other diagnostic procedures

- a. Liver and spleen scintigraphy using  $^{99m}\text{Tc}$  colloid is simple to perform and therefore recommended as the first imaging method of choice. The investigation should be carried out using SPECT where possible as this increases the potential of distinguishing between hepatic and splenic tissue. Denatured erythrocytes can be used subsequently if the colloid scintigram provides inadequate visualization.
- b. It is important to compare scintigraphy with ultrasound and CT images, which can be regarded as complementary, since areas of non-functional splenic tissue are visualised morphologically on ultrasound and CT.

## 5. Medical information necessary for planning

- a. Relevant ultrasound and CT results.
- b. Haematological information such as thrombocyte levels and the presence of Howell-Jolly bodies in the erythrocytes.

## 6. Radiopharmaceutical

Tracer:  $^{99m}\text{Tc}$  denatured autologous erythrocytes  
 Nuclide: Technetium-99m  
 Activity: 80 MBq  
 Administration: Intravenous

## 7. Radiation safety

### a. Pregnancy

Considering the relatively low dose, 80 MBq  $^{99m}\text{Tc}$  denatured autologous erythrocytes, the benefits of these diagnostics revenues will quickly outweigh the assumed risk to the unborn child. Erythrocytes are not known to be transported through the placenta. The estimated effective dose to the unborn child is 0,11 mSv for a 80 MBq dose of  $^{99m}\text{Tc}$ . For dosages under 100 mGy no health detriment has been reported for unborn children, therefore a dose of 0,5 mSv is acceptable.

### b. Lactation

Considering the low dose to the woman and considering that transport of erythrocytes to the mammary glands will be almost nil. According to ICRP 106 there is no need to interrupt breastfeeding, but due to possible free  $^{99m}\text{Tc}$  pertechnetate it is advisable to interrupt the feeding for 4 h. Breast milk collected during this 4 h period should be kept for 24 h before administration.

### c. Radiation exposure

The effective dose due to 80 MBq  $^{99m}\text{Tc}$  administered to the patient will be 1,52 mSv

## 8. Patient preparation/essentials for procedure

Preparation: None

## 9. Acquisition and processing

- Imaging time: 1 to 2 h post injection.
- Views: Anterior, posterior, LAO and LPO.
- For patients following splenectomy, the entire abdomen must be included in order to visualize the presence of any remaining spleen tissue or accessory spleen.
- See procedure for liver/spleen scintigraphy if SPECT is required.

Energy:  $^{99m}\text{Tc}$ -setting, 140 keV  
 Window: 15-20%  
 Collimator: LEAP  
 Counts: 300.000 counts per image  
 Computer: 128×128 matrix using a digital gamma camera

## 10. Interpretation

- Defects of the spleen can be caused by an infarction or haematoma and are unlikely to be any other type of SOL if clinical evaluation has been adequately performed.
- If the erythrocytes have not been denatured, only the blood pool will be visible and may be confused with other vascular structures. Only the blood pool is visible in the absence of splenic tissue.

## 11. Report

The report should contain the following information: The absence or presence of any splenic tissue including the shape, size and position of the spleen if present. Any defects and abnormalities of shape that could indicate rupture of the spleen or haematoma. The position of the abnormality in relation to abnormalities found on ultrasound and/or CT examinations.

## 12. Literature

- Armas RR, Thakur ML, Gottschalk A. A simplified method of selective spleen scintigraphy with Tc-99m labeled erythrocytes. Clinical applications. J Nucl Med 1980;21:413-6.
- Armas RR, Thakur ML, Gottschalk A. A simple method of spleen imaging with Tc-99m labeled erythrocytes. Radiology 1979;132:215-16.
- Atkins HL, Goldman AG, Fairchild et al. Splenic sequestration of Tc-99m labeled heat treated red blood cells. Radiology 1980;136:501-3.