

# **GASTROINTESTINAL BLEEDING STUDY**

## **(Tc-99m-Red Blood Cells)**

### **Overview**

- The Gastrointestinal Bleeding Study detects the extravasation of radiolabeled red blood cells from the vascular space into the gastrointestinal lumen. The subsequent movement of the extravasated red blood cells within the gastrointestinal lumen secondary to peristalsis allows localization of the site of bleed along the gastrointestinal tract.

### **Indications**

- Localization of gastrointestinal bleeding sites (1-3).
- Localization of non-gastrointestinal bleeding sites (4).

### **Examination Time**

- Variable, depends on whether and when the site of bleeding is identified.
- The study may be terminated as soon as the bleeding site is identified.
- Imaging can be performed for up to 36 hours with a single injection of radiopharmaceutical. Usually the patient will not tolerate lying under the camera for more than 3 hours at a time. However, imaging may be stopped and restarted.

### **Patient Preparation**

- None.

### **Equipment & Energy Windows**

- Gamma camera: Large field of view.
- Collimator: Low energy, high resolution, parallel hole.
- Energy window: 20% window centered at 140 keV.
- Computer.

### **Radiopharmaceutical, Dose, & Technique of Administration**

- Radiopharmaceutical: Tc-99m-red blood cells (5-7).
- Red blood cell labeling method (Either the in vivo/in vitro method or in vitro method give high labeling efficiencies):
  - In vivo/in vitro method (8).
  - In vitro method (9).
  - In patients with difficult veins, the in vivo method may be used (9).
- Dose: 25 mCi (925 MBq).

- Technique of administration: Standard intravenous injection.

### Patient Position & Imaging Field

- Patient position: Supine.
- Imaging field: Usually abdomen and pelvis; may exclude uppermost abdomen. (Occasionally position over a different part of the body depending on suspected site of bleed.)

### Acquisition Protocol

- Start the acquisition just before or simultaneously with injection of the radiopharmaceutical.
- Acquire serial 1 minute digital images in a 128 x 128 matrix for 30 minutes and save in a file (5).
- Immediately begin another 30 minute collection.
- Periodically show the images to the nuclear medicine physician on the computer display using the cine mode (10).
- Continue image acquisition until (11):
  1. The site of bleeding is localized.
  2. The patient will no longer lie under the camera.
  3. The patient is needed elsewhere for another study.
  4. The gamma camera and/or computer are needed for other studies.
  5. The nuclear medicine physician terminates the imaging session.
- Imaging may be resumed without an additional radiopharmaceutical injection for up to 36 hours (1).
- When a 24 hour image shows activity within the intestine and active bleeding is suspected, but not obvious, a second injection of Tc-99m-RBCs can improve detectability (12).

### Protocol Summary Diagram



### Data Processing

- None.

## Optional Maneuvers

- Provocative gastrointestinal bleeding study: Heparin may be given intravenously at the time of imaging in an attempt to increase the likelihood of a bleed (13,14).
- Enhanced cine display: The initial 1 minute images may be summed and subtracted from subsequent images to create a “subtraction cine” and/or the cine may be played backwards to improve appreciation of the source of the bleed (15).
- CT co-registration for anatomic localization: SPECT-CT imaging can improve specific anatomic localization of the bleeding site (16).
- Intraoperative localization: Imaging of sequential segments of small intestine in an ex vivo fashion may improve localization of the bleeding site (17).

## Principle Radiation Emission Data - Tc-99m (18)

- Physical half-life = 6.01 hours.

<u>Radiation</u>	<u>Mean % per disintegration</u>	<u>Mean energy (keV)</u>
Gamma-2	89.07	140.5

## Dosimetry - Tc-99m-Labeled Red Blood Cells (19)

<u>Organ</u>	<u>rads/25 mCi</u>	<u>mGy/925 MBq</u>
Heart	2.0	20.0
Liver	1.8	18.0
Spleen	1.5	15.0
Lungs	1.4	14.0
Kidneys	1.4	14.0
Blood	1.4	14.0
Red marrow	0.8	8.0
Whole body	0.4	4.0

## References

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#### Normal Findings

- > Winzelberg GG, McKusick KA, Froelich JW, et al: Detection of gastrointestinal bleeding with Tc-99m-labeled red blood cells. Sem Nucl Med 12:139-146, 1982.
- > Smith RK, Arterburn G: Detection and localization of gastrointestinal bleeding using Tc-99m-pyrophosphate in vivo labeled red blood cells. Clin Nucl Med 5:55-60, 1980.