

GALLIUM STUDY **(Ga-67 as Gallium Citrate)**

Overview

- Once injected into the blood gallium binds to circulating transferrin and then, by mechanisms that are not completely understood, localizes in areas of inflammation (infectious or non-infectious) and in some tumors.

Indications

- Detection and localization of chronic infection and fever of unknown origin (FUO) (1-3).
- Detection and localization of tumors (4,5).
- Evaluation of therapy for Hodgkin disease and lymphoma (6,7)
- Evaluation of interstitial lung disease (8).
- Evaluation of patients with acquired immunodeficiency syndrome (AIDS) (9,10).

Examination Time

- Initially: 15 minutes for injection of the radiopharmaceutical.
- Later :
 - > Infection: 1 hour for imaging at 6 or 24 hours (10).
 - > Tumor: 1 hour for imaging at 48 hours.(Delayed images beyond the first set of images are often needed.)

Patient Preparation

- None (11).

Equipment & Energy Windows

- Camera: Rotating gamma camera. Dual head gamma camera is preferred (12).
- Collimator: Medium energy, parallel hole.
- Energy windows:
 - θ One pulse height analyzer: 80-200 keV.
 - θ Two pulse height analyzers: 20% windows centered at 185 and 300 keV.

- θ Three pulse height analyzers: 20% windows centered at 93, 185, and 300 keV.
- θ Four pulse height analyzers: 20% windows centered at 93, 185, 300, and 394 keV.

- Computer with SPECT software.

Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical: Ga-67 citrate.
- Dose: 6 mCi (222 MBq).
θ 10 mCi (370 MBq) may be used in patients with known cancers.
- Technique of administration: Standard intravenous injection.

Patient Position & Imaging Field

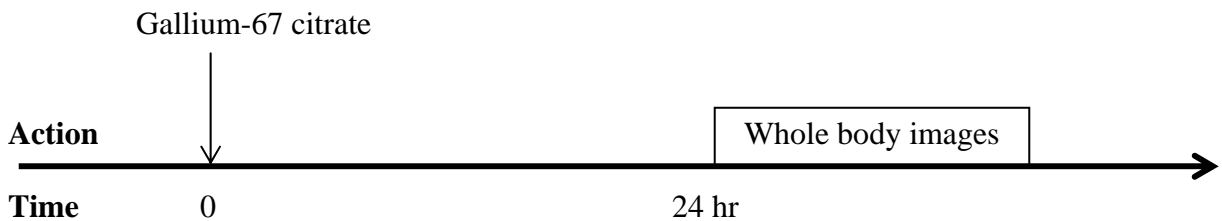
- Patient position: Supine.
- Imaging field: Depends on clinical indication; check with the nuclear medicine physician.

Acquisition Protocol

- Infection:
 1. Acquire initial images at 24 hours.
 2. Acquire delayed images as determined by the nuclear medicine physician at 48 hours and occasionally later. Parts of the body that are clearly normal at 24 hours do not need to be imaged at 48 hours.
 3. Acquire moving images at 5 cm/min or static images for 5-10 minutes each.
 4. ANT and POST images are acquired of the torso; occasionally other parts of the body are imaged and other projections are obtained - the nuclear medicine physician will specify the portion of the body to be imaged.
- Tumor - same as for infection (see above) except:
 1. Acquire initial images at 48 hours.
 2. Acquire delayed images as determined by the nuclear medicine physician at 72 hours and occasionally later.
- SPECT imaging - use routinely for limited studies and areas of uncertainty (5,6,13):
 1. Image acquisition parameters:
 - a) degrees of rotation: 360°.
 - b) number of images: 64.

- c) time per image: 20 seconds.
- Delayed imaging, usually at 24 hour intervals, may be needed to differentiate normal colonic activity from lesions in the abdomen.

Protocol Summary Diagram



Data Processing

- SPECT image reconstruction:
 1. The exact procedure for processing SPECT images depends on the computer software being used. This varies with the manufacturer and, in general, the manufacturer's protocol should be followed.
 2. The reconstruction process in general terms is:
 - a) correct the 64 planar images for uniformity (camera non-uniformity) using a high count, e.g. 30 million count, cobalt-57 flood acquisition.
 - b) check the images for patient motion and apply a motion correction algorithm if indicated and if available.
 - c) if the entire field of view is not of interest, indicate the region that is of interest to conserve computer time during reconstruction.
 - d) specify the filters to be used in the reconstruction process and the pixel thickness of the tomogram (usually 1 or 2 pixels).
 - e) reconstruct transverse, sagittal, and coronal image.

Optional Maneuvers

- Three dimensional display: The data may be processed as a maximum intensity projection (MIP) display (14).
- Lung uptake in the evaluation of interstitial pneumonitis: May be quantitated visually (8).

Principle Radiation Emission Data - Ga-67 (15)

- Physical half-life = 3.26 days.

Radiation	Mean % per disintegration	Mean energy (keV)
Gamma-2	38.3	93.3
Gamma-3	20.9	184.6
Gamma-5	16.8	300.2
Gamma-6	4.7	393.5

Dosimetry - Ga-67 Citrate (16,17)

Organ	rads/6 mCi	mGy/222 MBq
Large intestine	5.4	54.0
Bone marrow	3.48	34.8
Spleen	3.18	31.8
Liver	2.76	27.6
Skeleton	2.64	26.4
Kidney	2.46	24.6
Small intestine	2.16	21.6
Ovaries	1.68	16.8
Whole body	1.56	15.6
Testes	1.44	14.4

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Normal Findings

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