Tc-99m Technetium-Pyrophosphate Imaging for Cardiac Amyloidosis

Responsible Division: Division of Nuclear Medicine, Department of Radiology, UT Southwestern

Date Last Reviewed: 05/2018

POLICY BASIS FOR PROCEDURE

- To establish a clinical protocol for imaging cardiac amyloidosis

DESCRIPTION OF STANDARD PROCEDURE

SCOPE

All Nuclear Medicine Technologists and Physicians must adhere to these guidelines.

Indications:

- Suspected transthyretin (ATTR) cardiac amyloidosis.

Examination Time:

- Injection and Early Planar Imaging: 60 minutes
- Optional: Delayed imaging (SPECT-CT and Planar Imaging): 180 minutes. SPECT images can be acquired using standard chest acquisition or cardiac SPECT acquisition

Patient Preparation

- None.

Equipment & Energy Windows:

- Gamma camera: Large field of view for planar images and SPECT-CT (1).
- Collimator: Low Energy High Resolution
- Energy windows: 20% window centered at 140 keV.

Radiopharmaceutical, Dose, & Technique of Administration:

- Dose: 10-15 mCi (370-535 MBq)
- Technique of administration: Standard intravenous injection.

Patient Position & Imaging Field:

- Patient position: Supine with thorax in center of view and arms elevated.
- Imaging field: thorax with heart centered in mid field

Acquisition Protocol:

- Planar Imaging at 60 min (for quantitative technique) and 180 min (semi-quantitative technique)
- Images at each time period:
- Planar images in anterior, lateral and left anterior oblique (LAO) projections

- Delayed SPECT-CT imaging using dual detector system with LEHR collimators (Optional after 3 hour planar):

    1. Degrees of rotation: 360°.
    2. Number of images: 64.
    3. Time per image: 25 seconds.
    4. For the CT acquisition please adhere to manufacturer recommendations, including the application of the Care Dose and recommended scan times to be in compliance with ALARA.

Data Processing

- Display anterior, lateral and LAO images for both early and late planar images acquired.
- Quantitative Interpretation
    1. Using early anterior planar image, place circular regions of interest (ROI) over the heart and mirror that ROI over the contralateral chest (CL) to include the ribs. Avoid the sternum in the ROI
    2. Measure counts in each ROI and use to calculate a heart to contralateral (H/CL) ratio.
    3. H/CL rations >1.5 at one hour are classified as ATTR positive (1,2)

Semiquantitative Interpretation

A. Using delayed anterior planar image, a visual comparison is made to Rib uptake: (1,3)
Grade 0: no uptake in heart and normal bone uptake
Grade 1: uptake less than rib uptake
Grade 3: uptake equal to rib uptake
Grade 4: uptake greater than rib uptake with mile/absent rib uptake

1. Process SPECT/CT with AC correction and fuse images with CT
2. Send processed data to physicians for review before releasing patient

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Principle Radiation Emission Data

Radiation	Mean % per disintegration	Mean energy (keV)
Gamma-2	89.07	140.5

References:

1. ASNC Practice Points; 99M Technetium-Pyrophosphate imaging for transthyretin cardiac amyloidosis. 2016.

2. Bokhari S, Morgenstern R, Weinberg R, Kinkhabwala M, Panagiotou D, Castano A, DeLuca A, Kontak A, Jin Z, Maurer MS. Standardization of 99mTechnetium pyrophosphate imaging methodology to diagnose TTR cardiac amyloidosis. J Nucl Cardio 2018; 25(1): 181-190. and erratum J Nucl Cardiol 25(1): 347.

3. Hutt DF, Quigley AM, Page J, Hall ML, Burniston M, Gopaul D, Lane T, Whelan CJ, Lachmann HJ, Gillmore JD, Hawkins PN, Wechalekar AD. Utility and limitations of 3,3-diphosphono-1,2-propanodicarboxylic acid scintigraphy in systemic amyloidosis. Eur Heart J Cardiovasc Imaging. 2014 Nov; 15(11):1289-98. doi: 10.1093/ehjci/jeu107.

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