

Radiopharmaceutical: 99mTc-Methylene Diphosphonate (MDP, or Medronate)

Dose: 25 mCi

T1/2: 6 hours

Energy: 140 keV

CPT: 78305 (multiple areas); 78306 (whole body); 78315 (3 phase); 78320 (SPECT)

HCPCS: A9503 (Tc99m-MDP)

Indications include, but are not limited to:

1. Primary and metastatic bone neoplasms.
2. Disease progression or response to therapy.
3. Paget's disease of bone.
4. Stress and/or occult fractures.
5. Trauma – accidental and non-accidental (i.e. child abuse)
6. Osteomyelitis.
7. Musculoskeletal inflammation or infection.
8. Bone viability following grafts, or due to infarcts or necrosis.
9. Metabolic bone disease.
10. Arthritis.
11. Prosthetic joint loosening and/or infection.
12. Bone pain.
13. Myositis ossificans.
14. Complex regional pain syndrome (CRPS)/Reflex sympathetic dystrophy (RSD).
15. Abnormal radiographic or laboratory findings (i.e. alkaline phosphatase or tumor markers).
16. To localize distribution of osteoblastic activity prior to administration of skeletal therapeutic radiopharmaceuticals.

Procedures

- Whole Body Bone Scan
- Three Phase Bone Scan
- Bone SPECT

Patient Instruction:

1. There is no specific preparation patient needs to follow.
2. Obtain pertinent patient history including any history of recent injury, cancer history, orthopedic surgeries, as well as location of any prior imaging studies of affected area.
3. Set intravenous line for injection of radiopharmaceutical.
4. Administer radiopharmaceutical, imaging flow and blood pool for three phase bone scans, or immediately acquire blood pool wholebody scan.
5. Patient to return 2 to 4 hours following injection for serial imaging.
6. Instruct patient to drink 2-3 glasses of fluids during waiting period.
7. Patient needs to void bladder as needed and just prior to delayed imaging.

Radiopharmaceutical

1. 25 mCi 99mTc-MDP
2. For pediatric patients, administer 200 µCi/kg of body weight.

Equipment

1. Philips SKYLIGHT with VXUR collimators.
2. Philips Forte with VXUR collimators.
3. Philips Vertex with LEUHR collimators.

Procedure

Whole Body Bone Scan

- Administer radiopharmaceutical and flush with 10 to 20 mL of normal saline.
- Perform whole body blood pool study at a scan speed of 25 cm/min, ensuring 2 million total counts.
- Inform patient of time to return for delayed imaging.
- When patient returns, perform delayed whole body acquisition at a scan speed of 8 to 10 cm/min, ensuring 2 million total counts.
- Static images should be acquired for any areas not consistent with metastases, or to ensure that all bony structures are imaged.
- For prostate cancer, a recent PSA level is required. Also, a tail-on-detector image should be included.

Three Phase Bone Scan

- Position area of interest in field of view, inject radiopharmaceutical, and image perfusion.
- Perform static blood pool images in a minimum of two different planes.
- If patient has a history of cancer, a whole body blood pool scan should be performed at a speed of 25 cm/min.
- Inform patient of time to return for delayed imaging.
- When patient returns, perform same static images. If patient has a history of cancer, whole body scan should be performed at speed of 8 to 10 cm/min.

Bone SPECT

- SPECT should be performed as ordered or indicated (i.e. unexplained back pain, spondylosis, etc.)
- Position area of interest in field of view and image for 20 sec/frame for 128 frames.

Acquisition Parameters on Philips JETStream

Bone Flow

- Matrix size: 128 x 128
- Flow: 90 frames at 1 sec/frame
- Zoom: 1.0 (Full Field)

Statics

- Matrix size: 256 x 256
- Blood pool statics: 300 sec or 1,000 kcounts
- Delay statics: 300 sec or 1,000 kcounts
- Zoom: 1.0 (Full Field)

Whole Body scans

- Matrix size: High-Res. (512 x 1024 x 16)
- Blood pool scan speed: 25 cm/min
- Delay scan speed: 8 to 10 cm/min
- Zoom: 1.0 (Full Field)

Bone SPECT

- Matrix size: 128 x 128
- Zoom: 1.0 (Full Field)
- Number of angles: 128
- Time per angle: 20 sec
- SPECT mode: Step
- Orbit type: Non-circular
- Rotation direction: Counter-clockwise

Processing

BONE FLOW

1. Select REFRAME from top menu in Pegasys.
2. Choose FLOW ANTERIOR images and PROCEED.
3. Right click on SELECTION MENU, choose 5 and right click again on SELECTION MENU and choose 5 NON-STANDARD.
4. Left click on the 16-view image display, which is on the right side of the screen.
5. Change color scale to GREY.
6. Move images so as to skip any blank frames.
7. Increase brightness for interpretation.
8. Left click on the ANNOTATION DEFAULTS (pencil tool).
9. Right click on load defaults and choose proper labeling defaults, ensuring the proper image orientation.
10. Left click the camera icon to snapshot the image.
11. Do the same for FLOW POSTERIOR as necessary.

STATICS

1. Left click on ALL IMAGE DISPLAY from top menu in Pegasys.
2. Select images to display and PROCEED,
3. Increase brightness as necessary for interpretation.
4. Left click on pencil tool for annotation defaults. Choose proper labeling, ensuring proper image orientation.
5. Left click on camera icon to snapshot the image.

WHOLEBODY

1. Left click on 2 VIEW/4 VIEW WHOLEBODY DISPLAY from top menu in Pegasys.
2. Select in the following order: POSTERIOR BLOOD POOL, ANTERIOR BLOOD POOL, POSTERIOR DELAY, ANTERIOR DELAY and PROCEED.
3. Pan images so that top of patients skull is level across top of image.
4. Increase brightness as necessary using 10 BAND color to first white pixels. Change color to GREY.
5. Left click on pencil tool and select correct annotation defaults.
6. Left click on camera icon to snapshot the image.

SPECT

1. Left click on AUTOSPECT from top menu in Pegasys.
2. Select PROJECTION and PROCEED.

3. At top of screen, left click on OPEN. From listed defaults, choose BONE SPECT (12 iterations, Cutoff of 0.5, and Order of 5.0).
4. Perform motion correction as necessary.
5. Set yellow lines to outer limits of scan field and left click on RECONSTRUCT at top left of screen.
6. After reconstruction is complete, left click on REORIENT.
7. Adjust images, if needed.
8. Left click on SAVE at top right of screen.
9. Left click on QUIT.
10. Left click on MCD & MCD/AC PHYSICIANS REVIEW button on top menu in Pegasys.
11. Choose the TRANSVERSE images and PROCEED.
12. Left click on 3D.
13. Left click on VOLUME.
14. In transverse view, middle click at center of patient and extend green line beyond body habitus.
15. At right of screen, change DEPTH to 128, and VIEWS to 32.
16. Left click on CREATE. This will take a minute or so, then left click on SAVE, and PROCEED.
17. Left click on CANCEL, CANCEL, and QUIT.
18. Reverse the AXIAL and SAGITTAL images. To do this, left click on PAGE 2 at top right of menu at top of screen on Pegasys. Left click on SPECT FRAME REVERSE. Select TRANSVERSE images, this will automatically proceed and then reverse the frames. When the images reappear, left click on EXIT, and then SAVE SELECTED AND PROCEED. Do the same for the SAGITTAL images.
19. Display a composite of all scan planes. Left click on REFRAME from top menu on Pegasys.
20. Select TRANSVERSE-R images and PROCEED.
21. Right click on SELECTION MENU and then right click on 3. Right click on SELECTION MENU again, then right click on 3 STANDARD.
22. Left click on the 24 VIEW image display. Ensure that anatomy of interest is completely included in display range.
23. Increase brightness as necessary for interpretation.
24. Left click on the pencil tool, then choose the proper annotation defaults. Ensure that the proper patient orientation is noted on the images.
25. Left click on the camera icon and snapshot.
26. Repeat steps 20 to 25 for CORONAL and SAGITTAL planes.
27. DICOM all saved images, as well as raw projection data (for SPECT), and raw perfusion data (for 3 phase) to PACS.