

Letters to the Editor

Helpful Techniques in Thallium-201 SPECT Imaging

The application of proper technique in thallium-201 (^{201}Tl) myocardial single-photon emission computed tomography (SPECT) scanning is necessary to maximize diagnostic accuracy, and to minimize problems for the computer operator and the physician who interprets the scan. Minimizing problems related to positioning and immobilizing the patient is the main concern.

The procedure should be discussed at length with the patient, including IV placement, treadmill exercise, injection of ^{201}Tl 1–2 min prior to cessation of exercise, the quick trip to the camera room, and imaging, which requires lying flat with arms overhead for approximately 25 min. Encourage the patient not to speak during the scan and tell him/her to breathe normally and avoid any deep inhalations. Tell the patient that additional delayed images will be acquired 4 hours after injection.

After answering any questions the patient may have, the IV is begun, after which the patient's history is taken while the EKG technologist places the leads. The cardiologist is called and when he/she arrives the treadmill exercise protocol is begun. The treadmill room is equipped with a crash cart and a code blue button that immediately alerts the emergency team. A stopwatch is started at the time of ^{201}Tl injection, and the scan should begin within 10 min, or within 15 min if the patient is still breathing heavily. The cardiologist is asked if the IV drip should be continued during the scan; this is done when the patient has experienced some difficulty during exercise and leaves easy venous access if administration of medication becomes necessary. If the IV is not needed, it is removed and placed in a plastic bag until it can be disposed of properly. The patient is taken by guerny or wheelchair to the imaging room.

Whenever possible, the technologist imaging the patient during the initial scan should also be available to do the redis-

tribution scan 4 hours later, which facilitates duplication of the patient's position.

The patient lies on the scanning table with his/her head in the molded sponge used for brain scanning. A triangular sponge is placed under the knees, reducing back strain and making it easier to raise the patient's arms above the head. The arms are put through a loop of velcro and brought up above the head. The patient grips a handlebar device, of our own design, that slips on the end of the SPECT imaging table. The velcro strap and the handles support the patient's arms completely (Fig. 1). If the patient is a female with large breasts, the left breast is pulled medially and taped flat. If the patient shows a tendency to move hands or fingers, they may be taped to the handles.

The table is then raised and advanced into place. When positioning of the table is complete and the heart is in the center

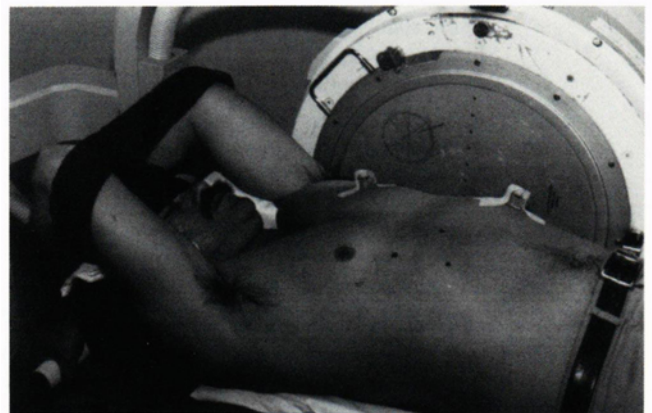


FIG. 2. The three points of laser light are marked directly on the patient's skin with a felt marking pen. Two 15- μCi point sources of ^{201}Tl are taped on the patient's chest.



FIG. 1. Velcro strap and handles support patient's arms.

of the field of view, the camera head is rotated 45° and brought as close as possible to the patient's left side. A laser beam positioning device mounted on the ceiling projects three points of light on the patient's chest. When positioning is complete, the laser is turned on and the three points are marked with a felt pen directly on the patient's skin (Fig. 2). These will be used to match the patient's position for redistribution scanning. Two 15- μCi point sources of ^{201}Tl are taped on the patient's chest (Fig. 2), one placed a few inches above the heart and the other a few inches below. These are imaged during the SPECT scan and are used to monitor movement of the thorax. In the absence of significant movement, they produce straight lines on a summed projection image.

The camera is then brought directly above the patient. The digital angle position gauge linked to the camera head is not

relied on to assure the camera is parallel to the floor. A more accurate oil-filled level placed on top of the camera is used. The camera is rotated to the 45° RAO position and the scan can be started. Tell the patient not to move any part of his/her body, nor to talk, unless some difficulty arises, and to breathe normally with no deep inhalations. The height of the table is measured and recorded on the work sheet; this height will be matched for the redistribution scan.

The study is acquired in 64 × 64 word mode with 32 images obtained for 30 sec each through a 180° arc from 45° RAO to 135° LPO. The start time is recorded on a work sheet at the time the scan is begun. It is important to record the start time accurately and for the redistribution because elapsed time is used in the computer analysis for washout quantification. Typically, 8–10 min elapse between injection and scanning initiation.

During the scan the technologist does not leave the room; this ensures that the patient will be at ease with the equipment, and if there is a malfunction, someone is there to correct the situation. Also, the technologist is there to watch for patient movement.

A check list is reviewed by the technologist to ensure that no step in the process has been neglected. The technologist sits at the head of the table observing the patient and the camera during acquisition. All pertinent information on the scan setup is recorded on the history sheet; this is particularly important if the original technologist is not available for the redistribution scan. When the patient returns at 4 hours, the redistribution scan is performed to reproduce the first scan exactly. Each detail of the original procedure is duplicated.

In summary, success or failure of SPECT ²⁰¹Tl scanning is highly dependent on technical considerations, particularly in view of the statistically limited nature of the study. A number of pitfalls await the unwary. Artifacts and other potential problems can be minimized only by careful attention to detail, particularly during image acquisition. Strict adherence to the above protocol will help optimize ²⁰¹Tl SPECT images.

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