# Equilibrium Radionuclide Angiocardiography (ERNA)

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## Standard ERNA Protocols and Associated Patient Radiation Doses[1]

Equilibrium radionuclide angiocardiography (ERNA), also termed multigated acquisition scan (MUGA), is an accurate and highly precise method to evaluate left ventricular global and regional function. Multiprojection planar imaging is performed routinely. Left ventricular ejection fraction (LVEF) and peak diastolic filling rate are derived by quantitative analysis. Single-photon emission computed tomography (SPECT) affords the additional benefits of quantification of LV and right ventricle (RV) volume and RV ejection fraction and better definition and localization of regional wall motion abnormalities. Echocardiography has supplanted ERNA for most routine clinical evaluation of ventricular function due to its ready availability and lack of ionizing radiation. However, ERNA remains the diagnostic method of choice in patients who are being followed for chemotherapy cardiotoxicity where changes in LVEF must be accurately quantified. Also, ERNA is useful in patients in whom the LVEF must be known to qualify them for certain interventions such as resynchronization therapy. Finally, in patients for whom echocardiography is technically suboptimal or inadequate, ERNA is of considerable value.

| Injected activity | Effective Dose Estimate |
|---|---|
| 20-35 mCi /70kg $^{99m}$Tc-labeled RBCs | 3 to 5.2 mSv for 20 mCi<br>3.75 to 6.5 mSv for 25 mCi |
| 20-35 mCi /70kg $^{99m}$Tc-labeled RBCs | 3.75 to 6.5 mSv for 25 mCi<br>5.25 to 9.1 mSv for 35 mCi |

## Recommendations to Decrease/Limit Patient Radiation Exposure

- Follow the recommendation of the American Society of Nuclear Cardiology to decrease patient radiation exposure to <9 mSv in 50% of patients by 2014 [2].
- Follow appropriate use guidelines in selecting patients for ERNA[3,4].
- Implement new software methods incorporating iterative reconstruction, resolution recovery and noise modulation that cope with lower cardiac SPECT counting statistics and thereby provide excellent image quality despite reduced-time SPECT acquisitions and/or reduced injected radiopharmaceutical activities[5,6].
- Implement new hardware methods, including cardio-focused collimation and solid-state detectors that provide excellent image quality despite reduced-time SPECT acquisitions and/or reduced injected radiopharmaceutical activities[5,6].

- In preference to "weight-base" dosing, whereby injected radiopharmaceutical activity is increased in larger patients, instead prolong SPECT acquisition times (as tolerated by the patient) to achieve equivalent myocardial count density scans [5,6].

## References


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