

Quality Control of Scintillation Cameras (Planar and SPECT)

Michael K. O'Connor, Mayo Clinic, Rochester, MN

Quality control of scintillation cameras starts with acceptance testing of the system. The results from acceptance testing become the foundation stone upon which routine quality control is based. A review of planar QC will focus primarily on intrinsic resolution and uniformity for the range of isotopes in clinical use, with periodic checks on the integrity of the collimators and gantry. Checks should also include evaluation of multi-energy registration and count-rate performance. In addition we will discuss the potential pitfalls in planar QC due not to equipment malfunction, but due to errors in the performance of the QC procedures. Such errors include incorrect use of point sources and problems with flood sources.

For SPECT systems, the two most important QC parameters are extrinsic uniformity and center of rotation correction. The review of SPECT QC will focus on system uniformity, how it should be measured, how it relates to the creation of ring artifacts, and how good is good enough for clinical use. We will discuss the required statistical accuracy of the uniformity correction and how it affects both clinical and phantom studies. In addition the special considerations for multi-head systems will be discussed. Center of rotation corrections will be reviewed as they relate to collimator hole angulation, gantry alignment and inter-head alignment and we will discuss the special cases of 90° dual-head systems and fan-beam collimators. We will review additional SPECT QC procedures that should be performed periodically (1-2 / year) to evaluate overall tomographic performance and changes in system uniformity with rotation.

Educational Objectives

1. To understand the basic QC procedures to be performed on planar gamma camera systems, and the potential pitfalls in QC procedures
2. To understand the requirements for uniformity and center of rotation corrections on single and multi-head tomographic systems.
3. To understand the need for additional SPECT QC procedures, such as measurement of tomographic resolution / uniformity and assessment of rotational uniformity.