

عنوان مقاله:

A practical method for assessing quantitative scanner accuracy with long-lived radionuclides: The ARTnet insert

محل انتشار:

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خلاصه مقاله:

Objective(s): To address the problem of using large volumes of long-lived radionuclides in test phantoms to check calibration accuracy of PET and SPECT systems we have developed a test object which (a) contains less radioactivity, (b) has a low total volume, and (c) is easier to store than currently used phantoms, while still making use of readily-available "standardised" test objects. **Methods:** We have designed a hollow acrylic cylindrical insert compatible with the NEMA/IEC PET Body Image Quality (IQ) phantom used in NU ۲ performance testing of PET systems. The insert measures ۹۰ mm internal diameter and ۷۰ mm internal height and so is sufficiently large to not be subject to partial volume effects in PET or SPECT imaging. The volume of the insert is approximately ۵۰۰ mL. It has been designed as a replacement for the standard long cylindrical "lung insert" in the IQ phantom without needing to remove the fillable hollow spheres of the phantom. The insert been tested with ^{18}F , ^{68}Ga and ^{123}I PET/CT and ^{99m}Tc , ^{131}I and ^{177}Lu SPECT/CT on scanners that had previously been calibrated for these radionuclides. **Results:** The scanners were found to produce accurate image reconstructions in the insert with $\pm 5\%$ of the true value without any confounding uncertainty from partial volume effects when compared to NEMA NU ۲-۲۰۱۸ Phantom measurement. **Conclusions:** The "ARTnet Insert" is simple to use, inexpensive, compatible with current phantoms and is suitable for both PET and SPECT systems. It does not suffer from significant partial volume losses permitting its use even with the poor spatial resolution of high-energy imaging with ^{131}I SPECT. Furthermore, it uses less radioactivity in a smaller volume than would be required to fill the entire phantom as is usually done. Long-term storage is practical while allowing .radioactive decay of the insert contents

کلمات کلیدی:

Site validation, Clinical trial, PET, SPECT

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