Systems And Methods For A Linearly Filled Nuclear Imaging Phantom

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a redesigned Derenzo style phantom that requires less radioisotope doped fluid volume and total radioactivity.

Overview

Nuclear imaging systems (e.g., SPECT, PET) commonly use imaging phantoms for quality assurance. One such phantom, called a Derenzo style phantom, is used in clinical and research applications to test resolution. The design features triangular hole (or "rod") patterns drilled into a cylinder, which is placed inside a chamber and submerged in radioisotope doped fluid.

Several problems, including incomplete filling and air bubbles, can make it difficult or impossible to image the phantom. Moreover, a significant volume of fluid is wasted because the entire chamber must be filled. Since the radioisotopes used in these phantoms represent a significant cost to research and clinical institutions a more efficient design is clearly needed. Further, a reduction in personnel dose may be effected by eliminating the "dead volume" of radioactivity in the reservoirs surrounding the phantom pattern.

The Invention

Collaborators from UW–Madison and the Morgridge Institute for Research have developed a new Derenzo style phantom with an interconnecting channel pattern. This enables the phantom to be filled linearly, with fluid flowing continuously through each of the passages. Compared to current methods, linear filling is simpler, faster and safer as it reduces the amount of radioactivity that is needed.

Applications

- Quality control phantom for SPECT and PET
- Useful in research scanners as well as clinical trials requiring multisite cross-brand calibration

Key Benefits

- Uses less radioactive filling material
- Reduces cost
- Less dose to technicians
- Piece-wise design is simple to fabricate, take apart and maintain.

Stage of Development

To test the performance of the new design for preclinical applications, four phantoms were constructed, filled with medically relevant isotopes (^{52}Mn, ^{64}Cu, ^{76}Br, ^{124}I) [illegible] successfully provided a Derenzo style pattern for the scanner to image and allowed the determination of the scanner's resolution capability for the different radioisotopes. These results were summarized in a recent publication (PMID: 27508106).

A clinical scale phantom has also been developed and is being tested against a conventional phantom with the same hole pattern. It has been scanned using ^{18}F and ^{89}Zr to date, providing images of the resolution pattern that are of higher quality that those of the conventional phantom, while reducing radioactivity by a factor of about seven.

Tech Fields

- Medical Imaging : Other diagnostic imaging

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867