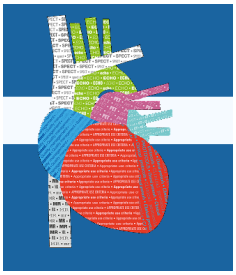

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Performance of 2D versus 3D PET Image Reconstruction Methods for Cardiac Imaging

Background: Fully 3D reconstruction methods has been widely used in current PET/CT scanners. However, some previous studies showed that 2D or 3D reconstruction modes had their own benefits for certain applications, i.e. 3D mode for brain imaging and 2D for whole body imaging. In this study, an image quality comparison among the PET cardiac images reconstructed with 2D, partial 3D and fully 3D reconstruction mode was investigated.

Methodology: The animal experiment was performed on uMI510 (manufactured by United Imaging), which had 96 rings and 23.4cm axial field of view. A dog was injected with NaF and scanned for 10 minutes. By limiting the ring differences of the coincidence events, the whole dataset was re-organized into 2D, partial 3D and fully 3D datasets. The images were reconstructed using either 2D or 3D Ordinary-Poisson OSEM algorithm, with attenuation, scatter and random corrections. Also, the techniques of time-of-flight (TOF) and point spread function (PSF) were applied.
The datasets were further processed by two ways: same scan duration time or same coincidence events. With the same scan duration time, the image reconstructed with fully 3D dataset has the highest quality, and the followings were those with ring difference of 8, 6, 4, 2, and the image with 2D dataset had the worst signal-to-noise ratio. However, if all datasets had the same level of coincidence events, the results were reversed. As shown in Figure 1.

Results and Conclusion: In this paper, an investigation of the performance of 2D versus 3D reconstruction methods for PET cardiac imaging was conducted. Larger detector accept angle increased the sensitivity to coincidences. But the sensitivity gain of trues were less than randoms and scatters. One reason was the randoms and scatters from out of FOV could not be ignored. So, 2D mode had the best NECR and 3D mode had the best sensitivity. Hence, 2D or partial 3D mode cannot be used for the applications such as dynamic and gated cardiac imaging.

Country/Organization invited to participate

china

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