

MotionFree

Addressing the biggest clinical challenge in PET/CT



Lesion Localization: Quantive Accuracy

The University of Washington Medical Center (UWMC) is 450-bed licensed, comprehensive medical care facility. The nearly 741 attending physicians are also full-time faculty members at the University of Washington School of Medicine. Since 1993 UWMC has been consistently ranked among the top hospitals nationally by the U.S. News & World Report "America's Best Hospitals". UW Medicine ranks first among public medical schools and second among all medical schools in federal research funding.

The University of Washington School of Medicine is a regional resource for Washington state, Wyoming, Alaska, Montana and Idaho - the WWAMI states.

The WWAMI program's purpose is to provide access to publicly supported medical education across the five-state region.

UWMC is a major teaching hospital where patients benefit from state-of-the-art care, an advanced-trained nursing staff, and a commitment to quality and value. UWMC is the site of a National Clinical Research Center and many major clinical research programs.



Equipment

UWMC upgraded their GE Advance PET system to the GE Discovery STE PET/CT with the Discovery Dimension and MotionFree PET/CT in 2005.

Impact of Respiratory Motion

In PET/CT oncology studies, CT is used to correct for photon attenuation of PET imaging. This requires that CT images be spatially registered with their corresponding PET image.

Respiratory motion can blur PET images making efforts to improve spatial resolution problematic. It can also make PET attenuation correction with CT inaccurate by mis-registering these two technologies that have very different temporal resolution in relation to patient respiration. The result is a reduction in image quality, lesion detectability and quantitative accuracy.

Motion Management in PET/CT

The Discovery Dimension allows UWMC medical staff to routinely perform 3 different protocols with FDG that can not be duplicated with other systems on the market.

"The great thing is that we can use these procedures on most patients. There is no additional cost in terms of time for scan or technologist workload. Its all built into GE's workflow" - Dr. Kinahan

PET First Protocol

GE's Discovery PET/CT has the flexibility to do a PET scan first, and then CT, or vice versa. Conventional PET/CT systems complete a CT scan, then PET protocol because of system limitations. "The flexibility of the PET/CT protocols introduced by the Discovery Dimension is key. Any CT protocol can be used to correct for the attenuation of a PET scan. The Discovery system allows us to go use a very low dose (5mAs) CT scan, which results in minimal additional radiation to the patient. As well, we believe that patients are more comfortable towards the end of a protocol. That results in less motion that we need to compensate for, which leads to better image quality."

CT Cine

Conducting studies over the diaphragm region can be problematic and result in significant motion artifacts because of patient respiration. Conventional PET/CT systems use a quick low dose helical CT to correct the attenuation of the PET image. However, the PET scan which is averaged over multiple respiratory cycles, corrected by a CT scan that is taken in one moment in time, may result in a mismatch in areas most affected by motion such as the diaphragm and liver.

The Discovery Dimension uses an effective approach by combining the average image of a cine CT image sequence, acquired over the diaphragm region with the standard helical scan.

The flexibility of the Discovery Dimension allows Dr. Kinahan to prescribe this complex procedure into a simple one-touch acquisition protocol that will automatically run the required PET and CT imaging sequences. This average CT Cine technique minimizes the impact of attenuation correction mismatches and motion artifacts. This results in excellent lesion detectability for diagnosis and staging and quantitative accuracy for a more confident quantitative baseline for treatment monitoring.

Respiratory Gating

The Discovery Dimension allows Dr. Kinahan to acquire the PET/CT images and automatically register these images with the patient's respiratory cycle to create a gated study. All the information for both the static and gated acquisitions are recorded within the same scan optimizing workflow and reducing dose to the patient. Once the information is recorded, Dr. Kinahan can replay this data anyway he chooses, whether it be static, multiple gated fields of view (to see the entire lung field for example) or gate the entire whole body.

With the flexibility of image display, the department is more confident in their patient diagnosis and staging with excellent lesion detectability especially in lesions affected by respiratory motion. A second benefit to respiratory gating, is by visualizing the complete range of motion of the active tumor, it provides more information for radiation treatment planning resulting in precise margin targets and treatment plan.

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