

PET/CT Imaging in Oncology

Clinical imaging has shown a remarkable development in the last two decades and has contributed tremendous and undeniable impetus to patient's care and clinical research. One of the most successful stories of current century is the debut of PET/CT on the horizon of clinical imaging. PET/CT is the integrated imaging which provides functional and anatomic information in a synergistic form. The development of the first hybrid positron emission tomography (PET) and computed tomography (CT) device struck a chord with the medical imaging community that is still ringing loudly throughout the world and paved the path for other hybrid imaging like SPECT/CT and PET/MR. Although these imaging options have broader spectrum of applications but it is the oncology where it has become a standard of care in the management of various cancers. Due to an ongoing research and development, various target specific radiopharmaceuticals have been introduced with high degree of precision. During this period we have also observed robust development on technological frontiers and introduction of new imaging protocols to minimize radiation exposure as well.

These integrated imaging especially PET/CT has revolutionized staging, re-staging, response evaluation and prognostication of many cancers. It is a now a well-established fact that integration of the integrated imaging in the management plan of cancers is not only cost effective but also reduces treatment related morbidities and improved over-all survival. In recent days, concept of metabolic tumor volume has been well taken by radiation oncologists. PET based delineation of metabolically most active tumor mass has better outcome after radiotherapy. Although there is limitation of disparity between metabolic tumor volume estimated by static or dynamic PET images. Metabolic tumor volume estimated by static PET images are easier to do but smaller than what measured by dynamic PET images which are difficult to acquire due to limited axial coverage of existing scanners.

Currently the response evaluation in oncology is based on anatomical size of the lesion(s) (Response Evaluation Criteria In Solid Tumors, RECIST) which has significant time lag with the metabolic response. Metabolic response based on PET/CT semi-quantitative parameter like standardized uptake value (SUV) is currently the most commonly used method for response evaluation. However, SUV values depend upon several confounding factors and most common are body weight, blood sugar level, uptake time, use of oral and intravenous contrast and processing software. For these reason SUV measured in the same individual would be different when acquired at same scanner at different point in time and also between two facilities. In fact this is the sentinel reason for lack of adoptability of (PET Response Criteria In Solid Tumors, PERCIST). This has sensitized the various societies across the world to develop and adopt a standardized PET/CT imaging protocol by every existing facility of world.

Currently there has been a staggering trend of patient's referral to PET/CT or other hybrid imaging facilities and imaging community as well as nuclear regulatory bodies must be cognizant of the previous experience of enormous radiation exposure to patients from nuclear cardiology and coronary CT angiography procedures. Therefore, it is imperative to exercise principle of justification and optimization and to adopt steps to enhance understanding of treating clinicians about the benefits and pitfalls of integrated imaging.

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