

6b

PET for monitoring therapy response

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Introduction: Positron emission tomography (PET) using the radiolabeled glucose analog 2-[¹⁸F]fluoro-2-deoxy-D-glucose (FDG) is increasingly used for response assessment in patients with lymphoma. Today, the ultimate goal is to minimize the long-term toxicities without losing treatment efficacy, and therefore tailor the intensity of the treatment to the individual patient. In this education session, we will especially focus on the value of PET for response assessment in lymphoma patients.

The past: Response to treatment was usually assessed by measuring the change in tumour volume on computed tomography, although reduction of tumour volume is only a late sign of treatment efficacy. Furthermore, tumour cells can be replaced by necrotic and fibrotic tissue, resulting in a residual mass and there are no reliable characteristics on CT to differentiate benign fibrosis from viable lymphoma. In 1999, an international group of clinicians, radiologists and pathologists published guidelines for response assessment in NHL, based on CT imaging. These International Workshop Criteria (IWC criteria) [1] are widely used in clinical trials and were rapidly adopted by clinicians for response assessment in both NHL and HD. Disappearance of all detectable disease (CR) after therapy is the main objective in lymphoma patients as it is associated with a longer progression-free and overall survival. This is in contrast to a partial remission (PR), in which the disease has only partly responded and some abnormalities suspected for active disease remain. Since conventional imaging techniques (CT and MRI) cannot reliably distinguish the nature of a residual mass, a new category of response was created to reflect the unknown significance of a good response (>75% reduction of tumor volume) but with persisting radiological abnormalities in patients who seem to be otherwise in CR. This new category of response was named "complete remission unconfirmed"(CRu). Despite the introduction of this new term, conventional imaging techniques fail to predict the clinical outcome after therapy.

The current: Functional imaging tools are based on the different metabolic characteristics of tumor cells and normal tissues and provide information complementary to conventional imaging techniques. It has been suggested for some time now, that the information provided by PET should be routinely used in therapy assessment of aggressive NHL and HD. However, before implementation in clinical practice, standardization of PET response is indispensable. The International Harmonization Project (IHP) has recently formulated new Integrated International Workshop Criteria [2] that combine PET and CT results. Besides the standardization of PET interpretation, the IHP has also formulated guidelines for integration of PET and CT results [3]. These new guidelines and criteria, together with the current authoritative literature will be discussed during the session.

The future: New integrated IWC+PET criteria perfectly meet the demand of PET/CT systems for a new scoring system as anatomical and metabolic information is provided in the same examination. However, before implementation of these guidelines in clinical practice, the initial results should be validated in larger (prospective) studies. Whether these guidelines will result in better overall and progression-free survival and whether these guidelines are cost-beneficial also needs to be clarified.

References

1. J Clin Oncol 1999;17:1244-1253.
2. J Clin Oncol 2007 10;25(5):571-8.
3. J Clin Oncol 2007 10;25(5):579-86.