

4a

Premises and perspectives of SPECT/CT

L. Mansi (Naples)

SPECT – CT was proposed in the first nineties with a commercial development based at beginning on low resolution CT. Major methodological approaches have been connected with the use for a CT – based attenuation correction in cardiology and , mainly in oncology, to better localize hot spots. The fast growing clinical applications of PET-FDG strongly supported the advent and the diffusion of hybrid systems. Today PET – CT, based on diagnostic multi-slice CT (MSCT), has virtually replaced stand alone PET Imaging on the basis of the evidence that combined modalities can improve the reader's confidence, therefore determining a better diagnostic accuracy able to change the patient management . Can we suppose that a similar future is coming up for SPECT – CT? Favourable premises are dependent on a certain improvement in evaluating images achievable when an anatomical localization is added to functional data obtained by SPECT, helping to transform unclear medicine in reliable nuclear medicine. The additional value is higher with respect to PET – CT because of the worst resolution and the higher noise determined by background. But the answer is not too easy, needing the discussion of many technical and methodological points also affecting a cost /effective analysis. At first we have to consider the field of interest of SPECT (and of planar imaging) in the PET era. We can certainly hypothesize that in the near future, i.e. in a time largely justifying the acquisition of a SPECT-CT system, gamma emitters can continue to be the bread and butter in Nuclear Medicine and/or a vital component of the routine work in many fields as cardiology, orthopaedics, neurology, nephrology, inflammation and infection, oncology. While its primary position is unquestionable in absence of PET tools, a significant advantage can be derived also when PET scanners are available, for the lower cost and the larger diffusion supporting its use , in presence of comparable results. Moreover further indications can be achieved in areas where gamma emitters can show significant advantages with respect to PET tracers , as in emergency or in studying radiotracers with a slow kinetic requiring analysis non permitted by fast decaying radionuclides. In this direction a very important perspective is connected to the pre-therapeutic dosimetry , for example using I-123 MIBG for I-131 MIBG, In-111 Octreotide for Y-90 Octreotide, In-111 zevelin for Y-90 Zevelin, and I-123 Bexxar for I-131 Bexxar. SPECT – CT technology is also in the road to give its own contribution to radiation therapy because of its capability to define the biological target. In this direction a primary indication could also be achieved to guide biopsy and/or interventional therapies. Further advantages both in defining a threshold for a differential diagnosis and/or for a better follow up evaluation could be permitted by a quantitative analysis, based on more rigorous mathematical models. An original capability can be developed in cardiology where to data achievable with gated SPECT can be added information on the coronary calcium score and , when a CT angiography is feasible, the vascular analysis. The future role can be significantly supported by the development of new radiotracers labelled with gamma emitters both improving present instruments and/or allowing a molecular imaging . Several agents developed and tested in animals and in some cases already under clinical evaluation strongly support the hope of a stary future for SPECT – CT. To better analyse present possibilities and capabilities of this hybrid system a brief discussion on the rationale, the economical and dosimetric justifications of systems based on different CT tools will be also presented. The possible incremental diagnostic value with respect to alternative procedures , including fusion imaging , will be then analysed. This lecture will be therefore a premise for the following speakers who will present major indications and clinical data already achievable starting by the literature and/or by their experience both in oncology and in non-malignant diseases trying to define the possible clinical impact of SPECT – CT today.