European guidelines for imaging osteomyelitis and spondylodiscitis

Prof. Alberto Signore, MD, PhD

Nuclear Medicine Unit, Department of Medical-Surgical Sciences and of Translational Medicine, Faculty of Medicine and Psychology, "Sapienza" University, Rome, Italy and Department of Nuclear Medicine and Molecular Imaging, University Medical Center Groningen, University of Groningen, The Netherlands (e.mail: alberto.signore@uniroma1.it)

In the last decades several improvements in the field of infectious and inflammatory diseases have been made in Nuclear Medicine (NM). Molecular imaging represents a valid diagnostic tool for detection of biological and biochemical changes in the earliest phases of diseases even before any radiological signs allowing the clinician not only to promptly identify the infective or inflammatory focus, but also to establish the best therapeutic approach for the patient.

In this perspective Nuclear Medicine techniques aim at differentiating "sterile inflammation" from "infection". These two terms cannot be used as synonyms but have to be clearly distinguished because they derive from different causes and they involve different molecular mechanisms. Inflammation is now considered a physiologic response of body (innate immunity) to different kind of harmful injuries (infection, tumours, trauma, autoimmunity) while infection is caused by microorganisms that, after invasion and multiplication in the organism, lead to a specific response (adaptive immunity)of host to the toxins they produce.

The gold standard for imaging infections is the use of radiolabelled white blood cells (WBCs) scintigraphy that, by exploring the dynamic influx of leukocytes in damaged tissues, represent a specific indicator of leukocytic infiltration that,according to physiology, increases with time.

These kind of cells can be labelled using ^{111}In-oxine, ^{99m}Tc-sulfur colloids, ^{99m}Tc-HMPAO, and recently they have also been labelled with ^{18}F-FDG for PET imaging. Other targets in infections are: the pathogens, the activated endothelial cells and cytokines, the molecules that occurs in inflammatory site due to increased vascular permeability and, of course, the polymorphonuclear cells (granulocytes) and different radiopharmaceuticals are commercially available for this purpose.

The knowledge of the complex phenomena that underlie infection and inflammatory processes is essential in order to select the correct diagnostic tool and to program a tailored therapy for the patient. For this perspective EANM established three primary objectives: Standardization, Education and Divulgation.

For the first aim, several guide-lines have been published in last years focused on clinical indication of WBCs and anti-granulocyte mAb scan, labelling procedure, image acquisition and interpretation criteria. The main clinical indications for these kind of examinations are osteomyelitis, inflammatory bowel disease (IBD) and the follow-up of patients with suspected infection of orthopaedic and vascular prostheses. For an accurate diagnosis of these clinical conditions a correct acquisition protocol must be performed using early, delayed and late images with acquisition times correctedfor isotope decay. Once acquired, all sets of images must be than displayed using the same intensity color-scale in order to avoid operator bias and the examination have to be correctly interpreted considering a scan positive for infection if there is any increase of uptake in time in terms of intensity or extent. Several guidelines also exist for FDG-PET/CT imaging in different infectious and inflammatory disorders being sarcoidosis, peripheral bone osteomyelitis, spondylodiscitis and evaluation of fever of unknown origin (FUO) the principal clinical indications.

As regard "Education" EANM established basic theoretical, practical and advanced courses with relative certificate of attendance and the license of European Society for imaging infection and inflammations and for cellular labeling.

Last but not least, "Divulgation" and collaboration with clinicians is essential for a correct management of patient. For this purpose,several diagnostic flow-chartsfor osteomyelitis, prosthetic joint infection and spondylodiscitis with the participation of European Societies of Radiology, Orthopaedics and Infectivology are being drafted and will be published soon.