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## Pathophysiological premises and procedures

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In the clinical scenario the role of a procedure is dependent not only on its capabilities, but also on capabilities of alternative methods, on epidemiology, on the clinical questions, on socio-economical issues determined by a cost-effective analysis mainly based on instruments and expertise locally available.

Therefore, to find indications for Nuclear Orthopedics, we have at first to describe the diagnostic scenario starting from the presentation of general information, i.e. advantages and limitations, achievable with X-ray, CT and MRI. Traditional X-ray is still today a first line examination in many patients, mainly in Emergency, because of practical advantages such as its diffuse availability and the low cost in presence of a sufficient accuracy in trauma. CT is the reference examination for the large majority of bone pathologies, while an increasing interest is connected with MRI, mainly in the evaluation of benign osteoarticular diseases.

To increase clinical reliability and usefulness of radionuclide procedures, pathophysiological premises and techniques have also to be well known, including knowledge of normal scans with variants and artifacts. Today, in Nuclear Orthopedics, the major role is yet devoted to bone scintigraphy performed with Tc-99m labeled diphosphonates. A methodological analysis optimizing the procedure is mandatory to better define clinical indications. Therefore, technical improvements and clinical information achievable by three - phase bone scan and SPECT will be also presented. In particular, a dynamic analysis, evaluating blood flow and the blood pool, can add useful information to that achievable with the analysis of the osteoblastic activity, in better defining mainly inflammatory diseases. The incremental role of SPECT is both connected with a higher sensitivity, of clinical relevance in detecting traumas, and in improving specificity better defining location and distribution of bone uptake. A brief general description of further capabilities added by hybrid SPECT - CT systems will be also presented. These systems permit a simultaneous acquirement of pathophysiological and morpho-structural data, with a significant improvement in accuracy, because of the complementary information between functional studies, characterized by a high sensitivity, and anatomical data acquired by CT, significantly increasing specificity. The basic premises and the more interesting clinical indications connected with other radionuclide procedures will be also discussed. At the present, two major implementations can play a role in Nuclear Orthopedics: Positron Emission Tomography (PET) with F-18 fluoro-deoxyglucose (FDG) in bone malignancies and radiolabeled white blood cells in acute inflammatory diseases. Lastly, the possible interest of other radiocompounds, such as Ga-67 citrate, F-18 fluoride, monoclonal antibodies, radiocolloids, MIBG and peptides will be also briefly presented.

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