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Letter to editor

## The Remarkable Applications of Nuclear Medicine in Orthopedic - ②

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## TO THE EDITOR

Nuclear Medicine is a form of scientific technology that gets more and more evolved over the last decades. With the use of advanced technologies, such as computerized  $\gamma$ -camera, PET and PET/CT, new generation PCs and new radiopharmaceuticals, it contributes to primary and safe diagnosis of various diseases. In Orthopedic, the use of Nuclear Medicine regards either the diagnosis or the facilitation of the therapy of many diseases. Periprosthetic infection and aseptic prosthesis loosening remain the most common and serious complications of total hip arthroplasty and total knee arthroplasty. Single-Photon Emission Computed Tomography (SPECT) and PET with computed tomography (SPECT/CT and PET/CT) provide additional information and increase diagnostic accuracy [1,2]. Also, Dual Phase 18F-fluoride PET/CT (DPFP) has a considerable result in differentiating septic from aseptic loosening of hip prostheses. DPFP may be employed before revision arthroplasty to evaluate implant for loosening and sepsis in loosened implant [3]. In regard to osteomyelitis and implant-associated infections, 18F-FDG PET identifies, with high sensitivity, the presence of osteomyelitis in patients with nonspecific clinical symptoms of infection [4]. As far as Orthopedic in children and young adults is concerned, 18F-fluoride PET/CT is useful for assessing the skeleton in metabolic bone diseases and evaluating benign skeletal lesions such as osteoid osteoma [5]. Even in the field of Orthopedic and Oncology, Nuclear Medicine gives undeniable critical help. In Tumor-Induced Osteomalacia (TIO) the only curative therapy is the resection. However, they are extremely difficult to be detected with conventional imaging modalities. Along with this, clinical studies show that Gallium-68 DOTANOC PET/CT can be used as the first imaging modality in such patients [6,7]. Furthermore, with the help of FDG PET/CT, Osteoid Osteomas (OOs), which are bone tumors that rarely occur in the cervical spine, can be confidently removed with no iatrogenic injury (injury of the vertebral artery, leakage of cerebrospinal fluid, infectious complications and neurological injury) [8]. In addition, static 18F-fluoride PET is a highly sensitive imaging modality for detection of benign and malignant osseous abnormalities and lytic and early marrow-based metastases, by identifying their accompanying reactive osteoblastic changes [9]. It has already been found since 2005, that  $^{99m}\text{Tc}(\text{V})$ -DMSA scan can identify, with high sensitivity, the metastases of osteosarcoma [10]. Last but not least is the large contribution of Nuclear Medicine in a big chapter of Orthopedic, the Arthropathies, some of which are Rheumatoid Arthritis, ankylosing spondylitis and spondylodiscitis. In Rheumatoid Arthritis (RA), an exploratory study has shown that macrophage PET scans may predict subclinical arthritis in early RA patients [11]. In this field, Nuclear Medicine provides more help with the growth of Radiosynovectomy. Asymmetric erosive synovitis, particularly affects peripheral joints in patients with (RA). Radiosynovectomy (with colloidal preparations of 90-Yttrium, 186-Rhenium, 188-Rhenium or 169-Erbium) is an approved, reliable and easily performed therapy for the treatment of chronic synovitis. Especially, Rhenium-188 tin colloid radiosynovectomy is a useful treatment in patients with chronic inflammatory conditions that resist to conventional treatment [12,15]. 18F-fluoride PET/MRI shows an increase uptake of 18F-fluoride in spinal of patients with ankylosing spondylitis due to the existence of syndesmophytes (which are associated with active bone synthesis). Moreover, 18F-fluoride PET/

CT has a high sensitivity in the diagnosis of spondylodiscitis and 18F-FDG PET/CT can detect the early response to antibiotic therapy in patients affected by infectious spondylodiscitis in such a way, that both of them should be considered as first-line imaging procedures [16,18]. Taking into account the important contribution of Nuclear Medicine in Orthopedic, as reaffirmed by the aforementioned studies' results, there seems to be a dire need for thinking the techniques of the former as a first-line imaging procedures of the latter. For this purpose, long-term studies, with collaboration between Orthopedic's and Nuclear Medicine's clinics, should be sponsored to examine the absolute superiority of the Nuclear Medicine's modalities to conventional techniques.

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