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Signore, Alberto; Glaudemans, Andor W J M

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Reply to comment by J.P. Suarez Fernandez on “Consensus document for the diagnosis of prosthetic joint infections: a joint paper by the EANM, EBJIS, and ESR (with ESCMID endorsement)”

Alberto Signore^{1,2} · Andor W. J. M. Glaudemans²

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Dear Sir,

We thank Dr. Suarez Fernandez for his comment and questions [1] regarding our consensus document for the diagnosis of prosthetic joint infection (PJI), which was prepared as a set of multidisciplinary guidelines by delegates of four European Societies and agreed by the board members of these four societies: the European Association of Nuclear Medicine (EANM), the European Bone and Joint Infection Society (EBJIS), the European Society of Radiology (ESR) and the European Society of Clinical Microbiology and Infectious Diseases (ESCMID) [2, 3].

Dr. Suarez Fernandez expressed his disagreement with some of the data and recommendations included in this guideline. The first comment is about statement 19 of the consensus document: “¹⁸F-FDG-PET in patients with suspected PJI has high sensitivity but lower specificity than white blood cell (WBC) scintigraphy or anti-granulocyte antibody scintigraphy”. Here, we performed a systematic review on the use of ¹⁸F-FDG-PET in patients with suspected PJI and the comparison with WBC scintigraphy. We agree completely that there are only a few good comparison studies available and that most studies were performed on out-dated camera systems, and in heterogeneous patient groups without a clear definition of PJI. We shared here also the results of a previous guideline

published in 2013 where a sensitivity of 95% and a specificity of 98% for knee and hip PJI were reported [4]. We just mentioned this paper as one of the 15 papers in this field and did not go into depth about the details of the analysis that was performed in this guideline leading to these percentages, but we also mentioned that there is discordance between several studies and reviews leading to a large range in sensitivity (28–91%) and specificity (34–97%) between all studies. It all depends on which interpretation criteria and which devices were used, and we all know that there is no agreement on which interpretation criteria are the best for the use of ¹⁸F-FDG-PET in PJI. For WBC scintigraphy, this is much more standardized the last years [5] and we can rely on the high mentioned diagnostic accuracies (> 90%) in several publications with this technique when using the correct acquisition and interpretation criteria [6–8].

The second comment is concerning the proposed flowchart for the use of nuclear medicine examinations in PJI. Here, ¹⁸F-FDG-PET is recommended as an alternative to three-phase bone scan when the time after the prosthesis implant is more than 2 years, since ¹⁸F-FDG-PET has a high sensitivity like bone scan. In our opinion, ¹⁸F-FDG-PET can be used as a rule-out technique in patients with low probability for PJI as an alternative for bone scintigraphy. With both techniques, it is possible to completely exclude a PJI in case of negativity. On the other hand, costs and availability should be considered. Dr. Suarez Fernandez thinks this affirmation is inaccurate. Indeed, in most of the cases, there is always to some degree FDG uptake visible, due to reactive inflammation around the metallic implant or due to reaction to loosening [9]; bone scintigraphy is easier to perform in most centres and is cheaper, so we fully agree that in clinical practice bone scan will be preferred by many clinicians and imagers above ¹⁸F-FDG-PET for this indication. However, we want to point out that this consensus document was written as an “evidence-based” guideline and not an “expert opinion” guideline. And, indeed, several papers were published suggesting a role

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✉ Alberto Signore
alberto.signore@uniroma1.it

¹ Nuclear Medicine Unit, Department of Medical-Surgical Sciences and of Translational Medicine, Faculty of Medicine and Psychology, “Sapienza” University of Rome, Rome, Italy

² Medical Imaging Center, Department of Nuclear Medicine and Molecular Imaging, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands

for ^{18}F -FDG-PET in PJI based on the high sensitivity. This is the reason for putting ^{18}F -FDG-PET with the same role as bone scan in the diagnostic flowchart, but we mention that it depends on local availability, expertise and costs which technique is preferred in a specific centre. And indeed, we agree that most centres will prefer bone scan in this situation.

The last comment is about a footnote of the flowchart, where it is suggested that ^{18}F -FDG-PET could be useful in evaluating low-grade infections. Several definitions exist of PJI, and also the definition of acute, delayed and late PJI, as well as high grade and low grade, or acute and chronic, differs between several publications. Since it is also not possible to define an exact timeframe after surgery when it can be suspected that bone scan or ^{18}F -FDG-PET will be negative, we suggest to wait for a period of 2 years from surgery for hip and shoulder prostheses, and up to 5 years for knee prostheses. As a personal opinion, we agree with Dr. Suarez Fernandez that in “late PJI”, WBC scintigraphy is the first choice, but ^{18}F -FDG-PET can be used, as mentioned earlier, as a rule-out investigation modality.

So looking in general at the comments, we actually share the same opinion; it is more a matter of interpretation of the key messages. The role of WBC scintigraphy is well established, with clear acquisition and interpretation criteria and with well-known results. ^{18}F -FDG-PET requires standardized interpretation criteria for PJI, and since these criteria do not exist yet, we still do not know exactly the role of this technique for this indication. From published evidence, we can certainly conclude that ^{18}F -FDG-PET can be used as a rule-out technique, although, in clinical practice, many physicians will prefer to perform bone scan. This brings us to the conclusion that we really need multicentre large prospective trials in patients with suspected PJI comparing WBC scintigraphy, bone scan and ^{18}F -FDG-PET with each other in the same patient, and evaluated by external blind readers. This is the only possibility to finally end the discussion on which technique is best to use in patients for PJI and to provide a complete evidence-based diagnostic flowchart.

Compliance with ethical standards The authors declare that they have no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

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