Eur J Nucl Med Mol Imaging (2014) 41:2154
DOI 10.1007/s00259-014-2879-3

LETTER TO THE EDITOR

Interim FDG PET scans in lymphoma: SUV measurement error may impair qPET methodology

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Received: 26 June 2014 / Accepted: 28 July 2014 / Published online: 12 August 2014

Dear Sir,

In their interesting article, Hasenclever et al. [1] proposed a quantitative extension of the Deauville scale to a continuous scale for assessing response in interim FDG PET scans performed in lymphoma patients. In an individual, they defined "qPET" as the ratio of SUV_{peak} (involving SUV_{max} + 3 hottest adjacent voxels) assessed in a target lesion to a reference liver SUV_{mean} obtained from a 30-ml cuboid volume. The authors concluded that qPET<1.3 excludes abnormal response with high sensitivity.

Although the qPET scale, like the Deauville scale, minimizes the influence of some factors either physiological (i.e. blood glucose level) or technical on its variability, the relative measurement error (MEr) should nevertheless be taken into account. MEr is the relative difference between a single estimate of a parameter and its average "true" value [2] and applies both to SUV_{peak} and SUV_{mean} when a qPET value in an individual is to be compared to a cut-off value: $\Delta qPET/qPET = \Delta SUV_{peak}/SUV_{peak} + \Delta SUV_{mean}/SUV_{mean}$.

We have recently published the variability of average SUV obtained by pooling n=5–10–15–20–25–30 hottest voxels [3]. MEr of SUV_{peak} in a target lesion can be estimated to be 10.8–14.2 % (n=5; 95–99 % reliability, respectively). MEr of SUV_{mean} in the liver can be estimated from Boktor et al.'s results in lymphoma patients [4]: 31.1–40.9 % (=100*[0.50/(2.23*$2^{1/2}$)]*1.96–2.58, with 95–99 % reliability, respectively [2]). Therefore, MEr of qPET may reach 41.9–55.1 % (95–99 % reliability, respectively). This result should be compared to the relative difference between the cut-off values proposed by Hasenclever et al. [1]: between 1.3 and 0.95 and between 1.3 and 2.0, this difference is 26.9 and 53.8 %, respectively. In other words, when applied to a cut-off value of 1.3, qPET MEr may be greater than the relative difference between 1.3 and 0.95 with 95 % reliability and even greater than that between 1.3 and 2.0 with 99 % reliability, corresponding to Deauville categories 3–4 and 4–5, respectively.

The above calculated estimation indicates that SUV MEr may impair qPET methodology. We therefore suggest that qPET variability should be specifically investigated in a series of lymphoma patients. Indeed, to the very best of our knowledge, it is not known whether, in an individual, target SUV_{peak} and liver SUV_{mean} are actually independent. Moreover, SUV_{peak} values in Laffon et al. [3] are larger than those usually assessed in interim FDG PET scans in lymphoma leading here to SUV_{peak} MEr underestimation.

Conflicts of interest None.

References

1. Hasenclever D, Kurch L, Mauz-Körholz C, Elsner A, Goergi T, Wallace H, et al. qPET—a quantitative extension of the Deauville scale to assess response in interim FDG-PET scans in lymphoma. Eur J Nucl Med Mol Imaging 2014;41:1301–8.
2. Bland JM, Altman DG. Measurement error. BMJ 1996;313:744–6.
3. Laffon E, Lamare F, de Clermont H, Burger IA, Marthan R. Variability of average SUV from several hottest voxel is lower than that of SUVmax and SUVpeak. Eur Radiol 2014;24:1964–70. doi:10.1007/s00330-014-3222-x.
4. Boktor RR, Walker G, Stacey R, Gledhill S, Pitman AG. Reference range for intrapatient variability in blood-pool and liver SUV for 18F-FDG PET. J Nucl Med 2013;54:677–82.

A reply to this letter can be found at doi: 10.1007/s00259-014-2880-x.

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