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Letter to the editor Journal of Nuclear Medicine

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Lesion detection and administered activity.

There is a preoccupation in Nuclear Medicine imaging with the risks posed from the use of radionuclides and the reduction in administered activities (1). Nearly all nuclear medicine presentations include information on the absorbed or effective doses from the radiopharmaceutical under discussion. The tiny carcinogenic risk, an extra 1 in 1000 risk from a typical diagnostic administered activity, is minimal (2) when the lifetime risk of cancer is up to 1 in 2 (3). The debatable risk (4) of induced cancer from the absorbed dose must be balanced against the risks of misdiagnosis and the effect of this on potential lifesaving treatment especially in patients with cancer. Of course, paediatric and benign disease investigation may require a more conservative approach.

Confirmation of the detrimental effects of reducing the administered activity on lesion detection can be seen in the recent paper in this journal by Rauscher et al. (5). This study, on the effect of reducing the administered activity on the sensitivity of ^{68}Ga PSMA-11 PET/CT imaging shows that, as would be expected the lower the simulated administered activity, the fewer lesions are detected. Three readers identified 21 lesions at the rate of 100%, 100% and 90% with a baseline administered activity (120-192 MBq) and 85%, 81% and 90% with two thirds of the baseline tracer activity.

The standard recommended activity of ^{68}Ga PSMA-11 of approximately 1.8-2.2 MBq/kg body weight is still under debate (6). If between 10% and 19% of lesions are missed by a reduction of one third of an administered activity of 120-192 MBq (5), this may imply that potentially up to one fifth of lesions are being missed by the standard administered activity compared with increasing the administered activity by one third.

Recommended standard administered activities should be optimised using clinical and phantom studies defining the required lesion size as seen on the image, the lesion background ratio and the administered activity required to achieve this in a time during which the patient can be expected to be motionless. There is the complication that the fraction of the injected activity, which is captured by the lesion will depend upon the biodistribution and metabolism of the disease being imaged. There is also the additional complication of the varying sensitivity and resolution of different imaging equipment marketed by different manufacturers.

It is time to move on from the situation where recommended activities are derived from the average of activities which produce an ‘acceptable’ image to a more scientific approach to ensure that small but clinically important lesions which may change patients’ management are not missed.

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