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REVIEW ARTICLE

Highlights from 2017: impactful topics published in the Annals of Nuclear Medicine

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Abstract

The aim of the review is to highlight articles published in 2017 in the Annals of Nuclear Medicine, an official peer-reviewed journal of the Japanese Society of Nuclear Medicine. Among all published manuscripts during the past year, we conducted a subjective selection of the most relevant topics. Fourteen fascinating articles are included in this review, ranging in topic from preclinical to clinical arenas.

Keywords Review · PSMA · ^{18}F-FDG · ^{11}C-methionine · ^{18}F-FBPA · Theranostics

Introduction

In accord with the scientific collaboration between Europe and Japan started in 2016 [1], we summarize the information in fourteen selected articles published in the Annals of Nuclear Medicine during January–December 2017. We have subjectively selected the most impactful topics, ranging from preclinical to translational to clinical scenarios, and concisely reported them.

Urology

Prostate cancer (PC) is one of the most fatal cancers for men worldwide and is reported to be the cancer men in Western countries get most frequently [2]. Recently, PET radiotracers targeting the prostate-specific membrane antigen (PSMA) have demonstrated favourable results for imaging prostate cancer (PC) patients in a variety of clinical contexts. Moreover, the potential utility of imaging other malignancies, such as renal cell carcinoma (RCC), as well as potential false-positive findings of PSMA-targeted radiotracers, have begun to be more widely reported [3]. Werner and colleagues performed a retrospective analysis exploring the frequency and degree of uptake in peripheral ganglia in both PC and RCC patients undergoing PET with the PSMA-targeted agent ^{18}F-DCFPyL [4]. The authors reported radiotracer accumulation in 95 of 98 (96.9%) patients in at least one peripheral ganglion with a descending frequency of ^{18}F-DCFPyL uptake in lumbar, cervical, stellate, celiac and sacral ganglia. However, further confirmatory studies are warranted due to the retrospective design of this study, and no histologic proof of the obtained PET results was given in the light of the benign nature and localization of ganglia. To conclude, while interpreting ^{18}F-DCFPyL PET for PC and RCC, a clinical reader should keep in mind that physiological uptake in the lumbar region is a frequent phenomenon which could be misinterpreted as a metastatic site, similar to potential false-positive findings in the celiac ganglia [5].

The researchers at the Istanbul University in Turkey investigated the relationship between serum PSA level, Gleason score of PC and the outcomes of ^{68}Ga-PSMA PET/CT in patients with recurrent PC [6]. This retrospective study of 109 consecutive patients who had PSA recurrence after radical prostatectomy (RP) and/or hormone therapy and/or radiotherapy showed a significant difference between ^{68}Ga-PSMA PET/CT positive (mean 48.05 ng/mL; median 9.14; range 0.27–640) and negative scans (mean 0.76 ng/mL; median 0.36; range 0.2–4-4) in terms of serum PSA value (Z 6.043; $p < 0.001$, Mann Whitney U test). In the receiver operating characteristics (ROC) analysis for this study cohort, the optimal cut-off value of serum PSA was determined to be 0.67 ng/mL for distinguishing between positive and negative scans,

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with an area under curve (AUC) of 0.952 (95% CI 0.911–0.993). On the other hand, no statistical significance was found between positive and negative ^{68}Ga-PSMA PET/CT findings in terms of Gleason score ($\chi^2 = 2.285$; $p = 0.319$). However, parameters on PSA kinetics such as PSA doubling time, PSA velocity and PSA density were not reported. In this study, authors found an optimal serum PSA cut-off value for distinguishing between positive and negative ^{68}Ga-PSMA PET/CT in line with current literature, although a median serum PSA value of 9.14 ng/mL higher than similar studies such as Ceci et al. [7] and Eiber et al. [8].

In PC, bone is the most common site of distant metastases; bone scintigraphy (BS) has a high sensitivity in identifying skeletal lesions and is an effective planar technique for whole-body skeletal examination. To date, BS has been interpreted visually; the study by Koizumi et al. from Japan assessed the performance of a computer-assisted diagnostic system for BS called BONENAVI in PC patients [9]. The authors retrospectively enrolled a cohort of 226 patients (124 with bone metastases and 101 without) with histologically proven PC, BS and CT scans performed within a month and a follow-up of at least 3 years. The BONENAVI system (version 2.1.7) [10, 11] shows two imaging markers: an artificial neural network (ANN) value, indicating the probability of having skeletal metastases, and a bone scan index (BSI) that expresses the tumour burden. Overall, sensitivity and specificity were respectively 82% (102/124) and 83% (84/101) for bone metastases detection. There were no significant differences among CT types (osteoblastic, osteolytic, mixed and invisible on CT), although low extent of disease (EOD) and faint BS uptake were associated with low ANN values and low sensitivity. Nevertheless, patients with solitary pelvic osseous metastases with faint BS uptake or adjacent to the urinary system may show false-negative BONENAVI results, suggesting the use of a pelvic SPECT/CT to avoid this overlay problem. On the other hand, patients with degenerative changes of the vertebra showed false-positive results.

Gynaecology

Among mesenchymal tumours, uterine leiomyoma is a benign tumour that occurs in 25–30% of women older than 30 years. Other mesenchymal tumours, such as uterine sarcomas, are uncommon and constitute only 3–7% of uterine malignancies. The differential diagnosis of uterine sarcoma from leiomyoma is crucial for effective treatment, particularly in the early phase of disease. In fact, while a conservative treatment is feasible in leiomyoma, the prognosis in patients with uterine sarcoma is poor, with an overall 5-year survival rate of 8–12% for advanced stages [12]. Intratumour heterogeneity in phenotypic and genetic properties is a widespread phenomenon of critical importance for tumour progression and responses to treatment [13]. ^{18}F-fluorodeoxyglucose (^{18}F-FDG) reflects metabolic heterogeneity associated with cellular and molecular characteristics, such as cell proliferation, necrosis, perfusion and the histological architecture. To date, textural feature measurements are suggested when assessing the heterogeneities of distribution of ^{18}F-FDG in tumours [14, 15]. Tsujikawa et al. from the University of Fukui, Japan, investigated the clinical significance of ^{18}F-FDG PET/CT textural features in order to discriminate uterine sarcoma from leiomyoma, retrospectively enrolling 55 patients (15 with histologically confirmed uterine sarcoma, 40 diagnosed with leiomyoma). The accuracy of PET features to help differentiate between uterine sarcoma and leiomyoma was evaluated using ROC analysis. Results showed that the intratumour distribution of ^{18}F-FDG was more heterogeneous in uterine sarcoma than in leiomyoma. When combining conventional features with textural ones, maximum standardized uptake value (SUV; cut-off: 6.0) combined with entropy (2.85) and correlation (0.73) provided the best diagnostic performance (100% sensitivity, 94% specificity and 95% accuracy). The authors reached the conclusion that, in combination with the conventional histogram statistics and/or volumetric parameters, ^{18}F-FDG PET/CT textural features reflecting intratumour metabolic heterogeneity are useful for differentiating between uterine sarcoma and leiomyoma, although the standardization of PET texture analysis will be necessary for inter-institutional evaluations.

Haematology

Among haematological malignancies lymphomas are the most common, and the majority have a B-cell origin [16]. Unfortunately, the relapse rate of B-cell lymphoma is high and sometimes recurring tumours develop resistance to conventional treatments (chemotherapy). In this setting new types of therapy are strongly desired. The study of Heryanto and colleagues from Maebashi, Japan, is the first that directly compares the therapeutic effects of radioimmunotherapy (RIT) and photoimmunotherapy (PIT) for treating B-cell lymphoma [17]. PIT is an emerging targeted cancer therapy that uses monoclonal antibodies (mAbs) as a vehicle to deliver a cytotoxic agent specifically to the tumour, as in RIT [18]. PIT uses mAbs conjugated with a photosensitizing near-infrared (NIR) phthalocyanine dye called IR700. In vitro studies revealed that the percentage of death of an aggressive lymphoma cell line was significantly higher than that of an indolent lymphoma cell line at the same light intensity. For example, when exposed to 10 J of NIR light, the percentage of dead aggressive lymphoma cells was approximately $26 \pm 3.2\%$, whereas the rate in the indolent lymphoma cells was only $13 \pm 0.3\%$. Furthermore, the authors performed in vivo RIT and PIT experiments with ^{90}Y- or IR700-conjugated anti-CD20 mAbs in both an indolent-type and an aggressive-type B-cell

lymphoma cell line. Results suggested that the therapeutic effect of PIT with 500 μg IR700-conjugated anti-CD20 mAbs was superior to any other therapies against aggressive tumours, and the time to tumour progression of the PIT group was significantly longer than that of the RIT group (25 ± 0.81, 16 ± 0.80 days). Nevertheless, RIT showed the highest therapeutic effect in indolent tumours with 6/6 mice (100%), achieving a complete response after treatment, whereas only 4/6 mice (66.7%) of the PIT group with 500 μg IR700-conjugated anti-CD20 mAbs had a complete response. However, one of the main disadvantages of PIT is the limited tissue penetration of NIR light (approximately 2 mm). To conclude, researchers suggest PIT would be a promising strategy for the locoregional treatment or control of B-cell lymphoma and, since PET and RIT each have distinctive advantages relative to one another, they could play complementary roles in these pathologies.

Breast cancer

In patients with breast cancer bone is the most common site for distant metastases, representing the first site of metastasis in 50% of patients [19]. BS has been widely used to search for bone metastases; its main advantage being the ability to evaluate the entire skeleton at a relatively low cost. On the other hand ^{18}F-FDG PET/CT is more sensitive for the detection of lytic bone metastases [20]. Sugihara et al. directly compared ^{18}F-FDG PET/CT and BS for the detection of bone metastases from breast cancer [21]. In this single-centre retrospective study the authors enrolled 88 patients with bone metastases from breast cancer (31 patients with histologically confirmed bone localization) and performed both BS and ^{18}F-FDG PET/CT within 1 month. Using CT, MRI and clinical follow-up to confirm bone lesions, the sensitivity using Fisher's exact test was 89% (78/88) and 94% (83/88) for BS and ^{18}F-FDG PET, respectively. Dividing bone lesions into four types (osteoblastic, osteolytic, mixed and negative on CT), they found that, in detecting osteoblastic metastases, the sensitivity was 94% (15/16) for BS and 69% (11/16) for ^{18}F-FDG PET. Furthermore, the sensitivity of ^{18}F-FDG PET for the osteoblastic type was significantly lower than for the other types ($p < 0.001$). Regarding tumour characteristics, a significant difference in the sensitivity of ^{18}F-FDG PET was observed between nuclear grade (NG) 1 and NG 2–3 ($p = 0.032$), with an SUV_{max} of NG1 tumours significantly lower than that of NG 2–3 ($p = 0.011$). However, the number of patients was too small and multivariate analysis was not applied. In conclusion, ^{18}F-FDG PET/CT was confirmed to be an excellent imaging modality for bone lesions caused by breast cancer, even though a significantly low ^{18}F-FDG uptake was seen in osteoblastic lesions and bone metastases from primary breast cancer with a low NG.

Neuro-oncology

Researchers from the University of Tokyo in Japan proposed a new automated method of calculating the normal reference value (N-value), through voxel-based analysis, for use as the denomination of the tumour-to-normal ratio (T/N) [22]. T/N is a representative index reflecting brain tumour activity by ^{18}F-FDG and ^{11}C-methionine (MET) PET. When evaluating tumour metabolism, a visual inspection by nuclear medicine experts is usually sufficient for the diagnosis of tumour malignancy; however, the discrimination of uptake level is limited, being a qualitative process. Among different indices proposed, the T/N is the most frequently used and seems to be more favourable for the evaluation of tumour aggressiveness, which also means that the normal cortex is the most appropriate region to use as a reference when evaluating tumour uptake [23]. The method proposed by Takahashi et al. was developed assuming that ^{18}F-FDG uptake is relatively high in the normal brain cortex, and that the tumour extent on MET-PET does not exceed more than half of the brain cortex area in most clinical settings. The combination of these characteristics allows the identification of the voxels corresponding to the normal cortex in both ^{18}F-FDG and MET-PET images. Data sets were obtained from 32 patients with newly diagnosed glioma and 13 patients with recurrent brain tumour. N-values determined by the proposed automated method showed excellent agreement with those determined by a manual ROI method (intraclass correlation coefficients with a two-way random-effects model >0.78). These values were significantly correlated with mean manual N-values ($p < 0.001$). Although ^{18}F-FDG-PET has a role in identifying the candidate region of normal grey matter and may be replaced with MRI, the method proposed is the first automated voxel-based method for providing the N-value needed to calculate a metabolic index in brain tumours.

Radionuclide therapy

Neuroendocrine tumours (NET) are a heterogeneous group of neoplasms arising from cells of the endocrine system. The discovery of somatostatin receptor overexpression on neuroendocrine tumour cells allowed receptor imaging with radiolabelled somatostatin analogues and somatostatin-based radiopeptide therapy. Currently, the peptide receptor radionuclide therapy (PRRT) is an accepted option for patients with diffuse and/or unresectable NET. De Jong et al. described a combined treatment consisting of 50% ^{177}Lu-DOTATATE and 50% ^{90}Y-DOTATOC [24]. This treatment extended the duration of survival time by three times in rats, thanks to the complementary characteristics of isotopes allowing irradiation of both large and small metastases. Kunikowska and colleagues from Poland determined the therapeutic efficacy and

toxicity of tandem $^{90}Y/^{177}Lu$-DOTATATE in patients with disseminated NET [25]. This retrospective study included 59 patients with diffused and progressive NET (24% G1, 76% G2). Among them, 19 patients had neuroendocrine pancreatic tumour, 17 originating from small bowel, 11 from large bowel, 5 unknown primary tumours, 2 bronchopulmonary and 5 others. Thirty-three patients (56%) previously received "cold" somatostatin analogues. The presence of somatostatin receptor was assessed using ^{68}Ga-DOTATATE PET/CT or ^{99m}Tc-HYNICTATE. Regarding PRRT, the patients received 3–5 courses (94% - 4 courses) with a total injected activity of 11.1–16.65 GBq in 6–12 weeks' period. The tandem therapy $^{90}Y/^{177}Lu$-DOTATATE treatment ratio was 1:1. During a median follow-up of 75.8 months (range 11–121 months), the observed progression-free survival (PFS) was 32.2 months, the overall survival (OS) was 82 months and 25 patients died. The observed 5-year overall survival was 63%, and a 2-year risk of progression was 39.4%. A statistical significance difference in the PFS and the OS was observed between primary tumours located in small bowel and large bowel NET, whereas the difference between other locations was not statistically significant. The treatment response according to RECIST 1.1 criteria consisted of a complete response in 2%, partial response in 22%, stable disease in 65% and progressive disease in 6% of patients. The disease control rate was 89%. The PRRT was well tolerated by all patients. One patient (2%) revealed myelodysplastic syndrome, and one (2%) grade 3 nephrotoxicity. These results indicate that the tandem radioisotope $^{90}Y/^{177}Lu$-DOTATATE therapy for patients with disseminated or inoperable NET is highly effective and safe, considering long-term side effects. However, a randomized trial is warranted to confirm these results.

Neurology

Single photon emission computed tomography (SPECT) imaging of the dopamine transporter (DAT) is widely used to assess presynaptic dopamine neuronal dysfunction in Parkinsonian syndrome and in dementia with Lewy bodies (DLB). The European Medicines Agency (EMA) approved the agent [^{123}I]FP-CIT under the name DATSCAN in 2000, and several studies in normal human populations have been reported in the literature [26, 27]. The study conducted by Yamamoto et al. was the first one to evaluate the effect of both age and gender on [^{123}I]FP-CIT binding to dopamine transporters in the Japanese population [28]. SPECT imaging was performed in 30 healthy Japanese controls (17 males, 13 females; range 50–86 years, mean 70 years). The specific binding ratio (SBR) was calculated by DATview software (AZE, Tokyo) and the authors observed a strong correlation between SBR and age, using linear regression analysis. The correlation coefficients in males and females were − 0.566 and − 0.502, respectively, suggesting a higher DAT availability in women than in men. The analysis of variance revealed that aging led to a decline of the SBR, and a significant difference (p = 0.005) was observed among generations. Gender also affected the SBR, and a significant difference has been observed (p = 0.036) between males and females by using a two-way factorial analysis of variance (ANOVA). The SBR in females was higher than in males. Consequently, a significant difference between 50s and 70s (p = 0.015) and 50s and 80s (p = 0.006) was reported. In conclusion, despite the small population involved in the study, the data collected should help in providing a database of [^{123}I]FP-CIT in healthy Japanese people and in making a differential diagnosis of Parkinsonian syndrome versus DLB.

The relative preservation of glucose metabolism in the posterior cingulate gyri compared to the precuni is named cingulate island sign (CIS), and it was reported in 1997 by Imamura et al. to be higher in patients with DLB than in those with AD. Moreover, CIS was reported to be highly specific for diagnosing DLB [29]. Imabayashi and colleagues validated the cingulate island sign with optimized ratios for discriminating DLB from AD by using brain perfusion SPECT with ^{99m}Tc ECD [30]. Their first objective was to optimize the VOI setting in order to be able to calculate the CIS values by setting statistically significant hypoperfusion areas as VOIs for both denominators and numerators. Their second objective was to was to evaluate their accuracy and, simultaneously, to retest the method described in a previous paper [31]. This single-centre and retrospective study enrolled/involved 31 patients with DLB, 13 ^{11}C-PiB-positive patients with AD and 18 cognitively normal subjects. When completing a second test, the AUC was 0.858 and the accuracy, sensitivity and specificity were 84.6, 84.6 and 84.6%, respectively. The ROC curve analysis with these optimized VOIs yielded a higher AUC of 0.882. The accuracy, sensitivity and specificity of these new CIS ratios were 84.6, 92.3, and 76.9%, respectively, with a threshold value of 0.281. These results indicate that, even though the resolution of SPECT is overall inferior to that obtained with PET, the accuracy, sensitivity and specificity reached by the authors were comparable to the ones obtained with PET. In conclusion, brain perfusion SPECT is useful not only in screening for dementia economically and with wide accessibility, but could also facilitate the differentiation of DLB from AD, when these new CIS ratios are properly used.

Osteonecrosis

A growing number of osteonecrosis cases involving the jaw associated with anti-resorptive agents have been reported since the first report of bisphosphonate-related osteonecrosis of the jaw (BRONJ) [32], and a new nomenclature of anti-resorptive agents-related osteonecrosis of the jaw (ARONJ)

was proposed [33]. The detection of early-stage ARONJ is essential, and BS can detect minimal, metabolic, vascular, and pathophysiologic changes in bone earlier than conventional radiography, CT and MRI [34–38]. In addition, several studies have demonstrated the usefulness of BS in the diagnosis of osteonecrosis of the jaw (ONJ) [39]. The aim of the study by Watanabe and colleagues was to validate a diagnostic ability of bone scan index (BSI) for early-stage ARONJ [40]. By analysing retrospectively 44 cancer patients treated with antiresorptive drugs, researchers found the maximum BSI of the jaw ($BSIJ_{max}$) to be significantly higher in patients who developed ARONJ than in those who did not, 3 months before the diagnosis of stage 2 ARONJ ($p < 0.0001$ and $p = 0.02$ in the maxilla and mandible, respectively). Using the cut-off values of 0.09% in the maxilla and 0.06% in the mandible, $BSIJ_{max}$ for predicting stage 2 ARONJ showed sensitivity and specificity of 88 and 96%, respectively, in the maxilla and 64 and 89%, respectively, in the mandible at 3 months before the diagnosis. The authors concluded that the merit of using $BSIJ_{max}$ would be objective calculation in daily clinical practice without dental records. Skilled readers and a differential diagnosis including ARONJ are recommended when high $BSIJ_{max}$ in routine oncologic surveillance is detected.

Preclinical

Hypoxia plays a significant role in tumour progression and angiogenesis and is associated with chemotherapy and radiotherapy resistance. To date ^{18}F-fluoromisonidazole (FMISO) is the most widely employed radiotracer for hypoxia imaging [41], although its accumulation mechanism still remains unclear. Recently, literature suggests that the glutathione conjugate of reduced FMISO (amino-FMISO-GS) might be the metabolite specifically found in the hypoxic regions of tumour tissues [42]. The same author, Masaki, and colleagues from Japan studied whether FMISO is metabolized to amino-FMISO-GS within tumour cells and how amino-FMISO-GS contributes to FMISO accumulation in hypoxic cells [43]. Tumour cells (FaDu, LOVO and T24) were treated with ^{18}F-FMISO and incubated under normoxic or hypoxic conditions. The FMISO metabolites were analysed and several glutathione conjugation-related factors of tumour cells were evaluated in vitro. FaDu tumour-bearing mice were intravenously injected with ^{18}F-FMISO and the tumours excised after 4 h, post-injection. Further autoradiography, imaging mass spectrometry (IMS) and histologic studies were performed by the researchers. The accumulation levels of ^{18}F-FMISO were significantly higher in hypoxic cells (radioactivity uptake in FaDu cells reached 0.851 ± 0.009% dose/mg protein) compared with normoxic cells, independent of cell type (FaDu: 0.122 ± 0.009%). Amino-FMISO-GS was produced, and its amount was significantly higher under hypoxic conditions compared to normoxic conditions in all FaDu, LOVO and T24 cells. In addition, the gene expression levels of Glutathione S-transferase P1 (GST-P1), evaluated with real-time PCR, were significantly higher in the FaDu cells compared to the LOVO and T24 cells. This suggests FMISO-PET depicts areas with high glutathione conjugation ability along with low oxygen levels. Therefore, FMISO-PET images may not provide a genuine reflection of tumour oxygen levels, as the imaging results appear to be influenced by glutathione conjugation ability in addition to oxygen levels.

Boron neutron capture therapy (BNCT) is an effective method for several types of cancers such as glioma and malignant melanoma [44]. 4-Borono-phenylalanine (BPA) is used as the major carrier of ^{10}B in BNCT. 4-Borono-2-^{18}F-fluoro-phenylalanine (^{18}F-FBPA) PET is usually performed before BNCT, and the accumulations in the tumour and normal tissues are evaluated by determining the relative uptake ratio. If the tumour to normal tissue ratio or tumour to blood ratio is more than 2.5, BNCT is considered to be indicated. Watabe and colleagues from Osaka, Japan, assessed a practical method for estimating the absolute boron concentrations in tissues after administration of BPA based on the SUVs determined from ^{18}F-FBPA PET images, then went on to validate the accuracy of the method [45]. Seven male rats inoculated with rat glioma C6 cell line were scanned after the injection of 30.5 ± 0.7 MBq of ^{18}F-FBPA. The values of measured boron concentrations (mBC) were calculated by inductively coupled plasma optical emission spectrometry (ICP-OES) [46], whereas estimated boron concentration (eBC) was calculated from the SUV_{max}. A paired t test was used to compare these two measures. Interestingly results showed the percent difference between the mBC and eBC, based on SUV_{max} calculation, was relatively underestimated for the lung (-48.4 ± 16.2%), small intestine (-37.8 ± 19.3%) and large intestine (-33.9 ± 11.0%); authors suggest as potential causes the partial volume effect arising from the air or faeces contained in these organs. In contrast, large overestimation was observed for the kidney (34.3 ± 29.3%), due to the influence of the high uptake in urine. Furthermore, they found that more accurate estimation was obtained with SUV_{max} rather than with the SUV_{mean}. To prevent the adverse effects of the alpha-particles emitted from ^{10}B after neutron capture, estimation of the absolute boron concentrations in the normal tissues is essential, and this study suggests a simple formula based on SUVs.

Evolutionary advances in hardware and software PET technology, such as point spread function (PSF) reconstruction, have been shown to improve diagnostic performance, but can also lead to important device-dependent and reconstruction-dependent variations in SUVs. This may preclude the multicentre use of SUVs as a prognostic or diagnostic tool or as a biomarker of the early response to antineoplastic treatments. The study by Lasnon et al. compared two SUV harmonization strategies using a newer reconstruction

algorithm that improves lesion detection, while maintaining comparability with older systems: the use of a second reconstruction compliant with harmonization standards and the use of a proprietary software tool (EQ.PET) [47]. SUVs for all reconstructions were compared with regression analyses and/or Bland–Altman plots. Overall, the researchers analysed 50 consecutive non-small cell lung cancer patients, founding 171 lesions: 55 lung lesions (32.2%), 87 lymph nodes (50.9%), and 29 metastases (16.9%). In these lesions, the mean PSF7/OSEM3D ratios for SUV_{max} and SUV_{peak} were 1.02 (95% CI: 0.93–1.11) and 1.04 (95% CI: 0.95–1.14), respectively. The mean PSFEQ/OSEM3D ratios for SUV_{max} and SUV_{peak} were 1.01 (95% CI: 0.91–1.11) and 1.04 (95% CI: 0.94–1.14), respectively. When comparing PSF7 and PSFEQ, Bland–Altman analysis showed that the mean PSF7/PSFEQ ratios for SUV_{max} and SUV_{peak} were 1.01 (95% CI: 0.96–1.06) and 1.01 (95% CI: 0.97–1.04), respectively. In conclusion, both technologies produce similar results, with EQ.PET sparing reconstruction and interpretation time. Other manufacturers are encouraged to either emulate this solution or to produce a vendor-neutral approach.

Conclusion

The selected fourteen articles published in the Annals of Nuclear Medicine during 2017 provided an interesting update in the nuclear medicine and molecular imaging fields, covering different topics from preclinical to theranostics.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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