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^{68}Ga-PSMA PET/CT and Prostate Cancer Diagnosis: Which SUVmax Value?

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Abstract. *Background/Aim: To evaluate the diagnostic accuracy of ^{68}Ga-prostate-specific membrane antigen (PSMA) positron emission tomography/computed tomography (PET/CT) in the diagnosis and staging of prostate cancer (PCa). Patients and Methods: From January 2021 to December 2022, 160 men (median age: 66 years) with PCa (median PSA of 11.7 ng/ml) before prostate biopsy underwent ^{68}Ga-PET/CT imaging examinations (Biograph 6; Siemens, Knoxville, TN, USA). The location of focal uptake on ^{68}Ga-PSMA PET/TC and standardized uptake values (SUVmax) were reported on a per-lesion basis for each International Society of Urological Pathology (ISUP) grade group (GG) PCa. Results: Overall, the median intraprostatic ^{68}Ga-PSMA SUVmax was 26.1 (range=2.7-164); in the 15 men with not clinically significant PCa (ISUP grade group 1) median SUVmax was 7.5 (range=2.7-12.5). In the 145 men with csPCa (ISUP GG≥2) median SUVmax was 33 (range=7.8-164). A SUVmax cut-off of 8 demonstrated a diagnostic accuracy in the diagnosis of PCa equal to 87.7% vs. 89.3% vs. 100% in the presence of a GG1 vs. GG2 vs. GG≥3 PCa, respectively. In addition, median SUVmax in the bone and node metastases was 52.7 (range=25.3-92.8) and 47 (range=24.5-65), respectively. Conclusion: ^{68}GaPSMA PET/CT with a SUVmax cut-off of 8 demonstrated a good accuracy in the diagnosis of csPCa (100% in the presence of GG≥3) showing a good cost-benefit ratio as a single procedure for the diagnosis and staging of high-risk PCa.*

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Prostate-specific membrane antigen (PSMA) is expressed in primitive and metastatic prostate cancer (PCa) (1, 2), and PSMA inhibitors conjugated with the radionuclides Gallium 68 (^{68}Ga) and fluoride 18 (^{18}F) are currently used for the diagnosis and staging of PCa (3-8); in fact, ^{68}Ga-PSMA positron emission tomography/computed tomography (PET/CT) has been demonstrated to be sensitive for the detection of primary prostatic lesions, regional lymphadenopathy (9) and clinical metastases (10). Recently, tumor uptake, which represents PSMA expression, has been highly correlated with the aggressiveness of the primary prostatic tumor (7, 8), allowing with a single procedure the diagnosis and staging of high-risk PCa.

This study prospectively evaluated the accuracy of ^{68}Ga-PSMA PET/CT in the diagnosis and staging of PCa.

Patients and Methods

From January 2021 to December 2022, 160 men (median age: 66 years; range=49-84 years) with PCa were evaluated by ^{68}Ga-PSMA PET/CT; 63 *vs.* 97 men were previously submitted to initial *vs.* repeated biopsy and 25 of them were enrolled in an Active Surveillance (AS) protocol (4). Median PSA was 11.7 ng/ml (range=4.5-160 ng/ml) and 42/160 (26.2%) had abnormal digital rectal examination (DRE); all clinical parameters of men with PCa are listed in Table I. The study was approved by the Ethics Committee of our Hospital. All patients, before prostate biopsy, underwent mpMRI (11, 12) and ^{68}Ga-PET/CT imaging examinations (1) (Biograph 6; Siemens, Knoxville, TN, USA). ^{68}Ga-PSMA was prepared with a fully automated radiopharmaceutical synthesis device (Eckert & Ziegler Eurotope, Berlin, Germany); ^{68}Ga-PSMA-11 was administered to patients *via* an intravenous bolus and scans were acquired in 3-dimensional mode with an acquisition time of 3 min per bed position. Images were processed to obtain PET, CT, and PET-CT fusion sections in the axial, coronal, and sagittal planes with a thickness of approximately 0.5 ~ cm. The location of focal uptake on ^{68}Ga-PSMA PET/TC (Figure 1), three-dimensional size, and standardized uptake value (SUVmax) values were reported on a per-lesion basis with a sextant scheme (apex, midgland, and base, each split into left and right) (11). The diagnosis of PCa was previously performed by

Table I. *Clinical, histological, and ^{68}Ga-prostate specific membrane antigen (PSMA) positron emission tomography/computed tomography (PET/CT) parameters in 160 men with prostate cancer.*

Clinical and biopsy findings (number of patients)	GG1 50	GG2 25	GG3 15	GG4 20	GG5 50
Initial biopsy	9	6	5	8	35
Repeated biopsy	41	19	10	12	15
Median PSA (range=4.5-160 ng/ml)	5.3	6.5	7.2	30	31
Abnormal DRE	0	2 (8%)	3 (20%)	7 (31.8%)	30 (60%)
Median GPC	30%	45%	70%	85%	90%
Median number of positive cores	3	8	10	12	13
mpMRI PI-RADS score ≥3	12 (24%)	10 (40%)	9 (60%)	16 (80%)	45 (90%)
^{68}Ga-PSMA PET/TC	11	14.7	20.8	40.6	42.8
Median SUVmax value (range)	(2.7-20)	(7.8-20)	(12.8-22.9)	(13.6-94.2)	(20-164)

ISUP GG: International Society of Urological Pathology Grade Group; mpMRI: multiparametric magnetic resonance imaging; PSA: prostate specific antigen; GPC: greatest percentage of cancer; DRE: digital rectal examination; PI-RADS: Prostate imaging reporting and data system; SUVmax: standardized uptake value.

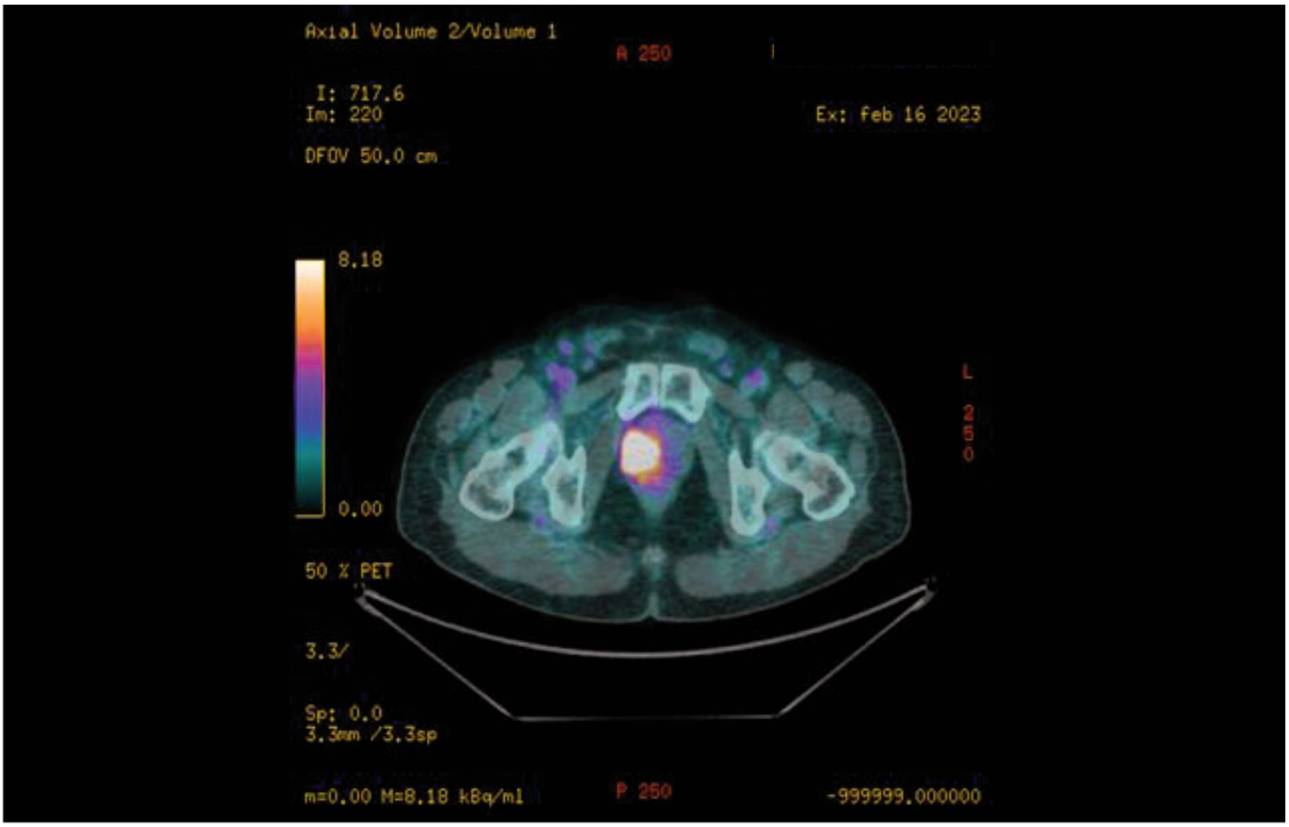

Figure 1. *^{68}Ga-prostate-specific membrane antigen (PSMA) positron emission tomography/computed tomography: presence of ISUP grade group 5 prostate cancer (SUVmax 18) in the right lobe of the gland (axial evaluation).*

extended systematic prostate biopsy (median 18 cores) (13,14) combined with four targeted cores in the presence of mpMRI (Prostate Imaging Reporting and Data System "PI-RADS version 2"≥3) and ^{68}GaPSMA-PET/CT lesions suspicious for PCa (1,12). The procedure was performed transperineally using a tru-cut 18-gauge needle (Bard, Covington, GA, USA) under sedation and antibiotic prophylaxis. Prostate-targeted cores were obtained using a Hitachi 70 Arietta ecograph (Chiba, Japan) supplied by a bi-planar transrectal probe by one urologist with 10 years of experience in cognitive targeted biopsy. Data were collected following START

criteria (15). None of the patients had clinical complications following prostate biopsy (Dindo-Clavien grade1) (16). The intraprostatic SUVmax value was evaluated for each International Society of Urological Pathology (ISUP) grade group (GG) PCa. In addition, the SUVmax value of the metastatic lesions was reported. For the statistical analysis, we used the Student's *t*-test with a *p*-value<0.05 considered as statistically significant.

Results

Among the 160 men with Pca, 50 (31.2%) were ISUP GG1, 25 (15.6%) ISUP GG 2, 15 (9.5%) ISUP GG3, 20 (12.5%) ISUP GG4, and 50 (31.2%) ISUP GG 5, respectively. In detail, 145/160 (90.7%) were csPCa (ISUP GG≥2): 119/160 (74.3%) and 41 (25.7%) were located in the peripheral and anterior zones of the gland, respectively. Clinical and histological biopsy parameters of men with PCa are reported in Table I. In the 160 men with PCa, the median intraprostatic ^{68}Ga-PSMA SUVmax was 26.1 (range=2.7-164): in the 15 men with not clinically significant PCa (ISUP GG1) median SUVmax was 7.5 (range=2.7-12.5); only 1/25 (4%) of patients enrolled in the AS protocol was reclassified. In the 145 men with csPCa, median SUVmax was 33 (range=7.8-164) and significantly correlated with PCa grade group: ISUP GG3 (SUVmax 20.8) *vs*. ISUP GG4 (SUVmax 40.6) and GG5 (SUVmax 42.8), (p=0.01), respectively (Table I). Median SUVmax in the bone and node metastases was 52.7 (range=25.3-92.8) and 47 (range=24.5-65), respectively.

A SUVmax cut-off equal to 8 demonstrated a diagnostic accuracy in the diagnosis of csPCa equal to 87.7% *vs*. 89.3% *vs*. 100% in the presence of a GG1 PCa *vs*. GG2 PCa *vs*. GG≥3 PCa, respectively.

Discussion

^{68}Ga-PSMA-PET/CT is recommended to improve the clinical staging of high-risk PCa and disease recurrence (1, 10, 17); at the same time, PSMA PET/CT has been proposed for the diagnosis of primary intraprostatic cancer because a positive PET/CT scan results from a combination of factors, such as homogeneity and intensity of PSMA expression, tumor volume, and grade. The presence of focal uptake on PSMA-PET/CT, SUVmax, and the maximal dimensions of PET-avid lesions have been correlated with the presence of csPCa (18-21). There is a range of proposed cutoffs to detect csPCa from SUVmax 3.15 to SUVmax 9.1 (22-26). Kalapara *et al*. (27) compared the accuracy of ^{68}Ga-PSMA PET/CT with mpMRI in 205 men who underwent radical prostatectomy and showed an accuracy of 96% *vs*. 91% for the detection of csPCa. Demirci *et al*. (22) in 141 patients submitted to radical prostatectomy showed that the SUVmax values were significantly higher in high-risk patients compared those in low-risk patients (18.9±12.1 *vs*. 7.16±6.2). Recently, the PRIMARY study (28) evaluated the clinical significance of intraprostatic patterns of PSMA activity, proposing a 5-point PRIMARY score to optimize the accuracy of ^{68}Ga-PSMA PET/CT for csPCa; ^{68}Ga-PSMA PET/CT was centrally read for pattern [diffuse transition zone (TZ), symmetric central zone (CZ), focal TZ, or focal peripheral zone (PZ) and intensity (SUVmax)]. In this post hoc analysis, a 5-level PRIMARY score was assigned on the basis of analysis of the central read: no pattern (score of 1), diffuse TZ or CZ (not focal) (score of 2), focal TZ (score of 3), focal PZ (score of 4), or an SUVmax of at least 12 (score of 5). Sensitivity, specificity, positive predictive value, and negative predictive value for a PRIMARY score≥3 (high-risk patterns) were 88%, 64%, 76%, and 81%, respectively.

In definitive, in the last years, ^{68}Ga-PSMA PET/CT evaluation has been proposed in men with clinically suspicious high risk PCa and/or when mpMRI cannot be performed (claustrophobia, cardiac pacemaker, and severe obesity) (1, 29, 30-32).

In our series, among the 160 men, ^{68}Ga-PSMA was correlated with the aggressiveness of PCa; in detail, a SUVmax of 8 demonstrated the presence of a csPCa in 142/145 (98%) with a false positive rate of 4.8% (7 cases). On the contrary, only 3/25 (12%) men with a ISUP GG2 had a SUVmax below 8. In addition, median SUVmax in the bone and node metastases was 52.7 (range=25.3-92.8) and 47 (range=24.5-65), respectively.

Our study has some limitations. First, a greater number of patients should be evaluated; second, the results should be evaluated in the entire prostate specimen and not in biopsy histology. Finally, the true accuracy of ^{68}Ga-PSMA PET/CT in the diagnosis of PCa should be evaluated also based on the biopsy specimen with a benign pathology.

Conclusion

^{68}GaPSMA PET/CT with a SUVmax cut-off of 8 demonstrated a good accuracy in the diagnosis of csPCa (100% in the presence of GG≥3) and metastases and has a good cost-benefit ratio as a single procedure for the diagnosis and staging of high-risk PCa.

Conflicts of Interest

The Authors declare no conflicts of interest in regard to this study.

Authors' Contributions

Pepe Pietro designed, interpreted clinical data, and wrote the manuscript. Pepe Ludovica, Tamburo Maria, Marletta Giula, Savoca Francesco, Pennisi Michele, and Fraggetta Filippo analyzed and interpreted the clinical data. All Authors revised the manuscript critically for important intellectual content and approved its final version.

References

1 Pepe P, Pepe L, Cosentino S, Ippolito M, Pennisi M and Fraggetta F: Detection rate of (68)Ga-PSMA PET/CT *vs*. mpMRI targeted biopsy for clinically significant prostate cancer. Anticancer Res *42(6)*: 3011-3015, 2022. PMID: 35641295. DOI: 10.21873/anticanres.15785

2 Sheikhbahaei S, Afshar-Oromieh A, Eiber M, Solnes LB, Javadi MS, Ross AE, Pienta KJ, Allaf ME, Haberkorn U, Pomper MG, Gorin MA and Rowe SP: Pearls and pitfalls in clinical interpretation of prostate-specific membrane antigen (PSMA)-targeted PET imaging. Eur J Nucl Med Mol Imaging *44(12)*: 2117-2136, 2017. PMID: 28765998. DOI: 10.1007/s00259-017-3780-7

3 Lopci E, Lazzeri M, Colombo P, Casale P, Buffi NM, Saita A, Peschechera R, Hurle R, Marzo K, Leonardi L, Morenghi E, Balzarini L, Disconzi L, Guazzoni G, Chiti A and Lughezzani G: Diagnostic performance and clinical impact of PSMA PET/CT *versus* mpMRI in patients with a high suspicion of prostate cancer and previously negative biopsy: a prospective trial (PROSPET-BX). Urol Int: 1-7, 2023. PMID: 36724746. DOI: 10.1159/000528720

4 Pepe P, Roscigno M, Pepe L, Panella P, Tamburo M, Marletta G, Savoca F, Candiano G, Cosentino S, Ippolito M, Tsirgiotis A and Pennisi M: Could 68Ga-PSMA PET/CT evaluation reduce the number of scheduled prostate biopsies in men enrolled in active surveillance protocols? J Clin Med *11(12)*: 3473, 2022. PMID: 35743547. DOI: 10.3390/jcm11123473

5 Perera M, Papa N, Roberts M, Williams M, Udovicich C, Vela I, Christidis D, Bolton D, Hofman MS, Lawrentschuk N and Murphy DG: Gallium-68 prostate-specific membrane antigen positron emission tomography in advanced prostate cancer-updated diagnostic utility, sensitivity, specificity, and distribution of prostate-specific membrane antigen-avid lesions: a systematic review and meta-analysis. Eur Urol *77(4)*: 403-417, 2020. PMID: 30773328. DOI: 10.1016/j.eururo.2019.01.049

6 Privé BM, Israël B, Schilham MGM, Muselaers CHJ, Zámecnik P, Mulders PFA, Witjes JA, Sedelaar M, Mehra N, Verzijlbergen F, Janssen MJR, Gotthardt M, Barentsz JO, van Oort IM and Nagarajah J: Evaluating F-18-PSMA-1007-PET in primary prostate cancer and comparing it to multi-parametric MRI and histopathology. Prostate Cancer Prostatic Dis *24(2)*: 423-430, 2021. PMID: 32999466. DOI: 10.1038/s41391-020-00292-2

7 Uprimny C, Kroiss AS, Decristoforo C, Fritz J, von Guggenberg E, Kendler D, Scarpa L, di Santo G, Roig LG, Maffey-Steffan J, Horninger W and Virgolini IJ: (68)Ga-PSMA-11 PET/CT in primary staging of prostate cancer: PSA and Gleason score predict the intensity of tracer accumulation in the primary tumour. Eur J Nucl Med Mol Imaging *44(6)*: 941-949, 2017. PMID: 28138747. DOI: 10.1007/s00259-017-3631-6

8 Emmett L, Buteau J, Papa N, Moon D, Thompson J, Roberts MJ, Rasiah K, Pattison DA, Yaxley J, Thomas P, Hutton AC, Agrawal S, Amin A, Blazevski A, Chalasani V, Ho B, Nguyen A, Liu V, Lee J, Sheehan-Dare G, Kooner R, Coughlin G, Chan L, Cusick T, Namdarian B, Kapoor J, Alghazo O, Woo HH, Lawrentschuk N, Murphy D, Hofman MS and Stricker P: The additive diagnostic value of prostate-specific membrane antigen positron emission tomography computed tomography to multiparametric magnetic resonance imaging triage in the diagnosis of prostate cancer (PRIMARY): a prospective multicentre study. Eur Urol *80(6)*: 682-689, 2021. PMID: 34465492. DOI: 10.1016/j.eururo.2021.08.002

9 Eiber M, Weirich G, Holzapfel K, Souvatzoglou M, Haller B, Rauscher I, Beer AJ, Wester HJ, Gschwend J, Schwaiger M and Maurer T: Simultaneous (68)Ga-PSMA HBED-CC PET/MRI improves the localization of primary prostate cancer. Eur Urol *70(5)*: 829-836, 2016. PMID: 26795686. DOI: 10.1016/j.eururo.2015.12.053

10 Pepe P and Pennisi M: Should 68Ga-PSMA PET/CT replace CT and bone scan in clinical staging of high-risk prostate cancer? Anticancer Res *42(3)*: 1495-1498, 2022. PMID: 35220244. DOI: 10.21873/anticanres.15621

11 Pepe P and Pennisi M: Morbidity following transperineal prostate biopsy: Our experience in 8.500 men. Arch Ital Urol Androl *94(2)*: 155-159, 2022. PMID: 35775338. DOI: 10.4081/aiua.2022.2.155

12 Pepe P, Garufi A, Priolo GD, Galia A, Fraggetta F and Pennisi M: Is it time to perform only magnetic resonance imaging targeted cores? Our experience with 1,032 men who underwent prostate biopsy. J Urol *200(4)*: 774-778, 2018. PMID: 29679618. DOI: 10.1016/j.juro.2018.04.061

13 Pepe P, Pennisi M and Fraggetta F: How many cores should be obtained during saturation biopsy in the era of multiparametric magnetic resonance? Experience in 875 patients submitted to repeat prostate biopsy. Urology *137*: 133-137, 2020. PMID: 31758981. DOI: 10.1016/j.urology.2019.11.016

14 Pepe P and Pennisi M: Prostate cancer diagnosis and management across twenty years of clinical practice: a single-center experience on 2,500 cases. Anticancer Res *39(3)*: 1397-1401, 2019. PMID: 30842174. DOI: 10.21873/anticanres.13254

15 Moore CM, Kasivisvanathan V, Eggener S, Emberton M, Fütterer JJ, Gill IS, Grubb Iii RL, Hadaschik B, Klotz L, Margolis DJ, Marks LS, Melamed J, Oto A, Palmer SL, Pinto P, Puech P, Punwani S, Rosenkrantz AB, Schoots IG, Simon R, Taneja SS, Turkbey B, Ukimura O, van der Meulen J, Villers A, Watanabe Y and START Consortium: Standards of reporting for MRI-targeted biopsy studies (START) of the prostate: recommendations from an International Working Group. Eur Urol *64(4)*: 544-552, 2013. PMID: 23537686. DOI: 10.1016/j.eururo.2013.03.030

16 Dindo D, Demartines N and Clavien PA: Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg *240(2)*: 205-213, 2004. PMID: 15273542. DOI: 10.1097/01.sla.0000133083.54934.ae

17 Combes AD, Palma CA, Calopedos R, Wen L, Woo H, Fulham M and Leslie S: PSMA PET-CT in the diagnosis and staging of prostate cancer. Diagnostics (Basel) *12(11)*: 2594, 2022. PMID: 36359439. DOI: 10.3390/diagnostics12112594

18 Hofman MS, Lawrentschuk N, Francis RJ, Tang C, Vela I, Thomas P, Rutherford N, Martin JM, Frydenberg M, Shakher R, Wong LM, Taubman K, Ting Lee S, Hsiao E, Roach P, Nottage M, Kirkwood I, Hayne D, Link E, Marusic P, Matera A, Herschtal A, Iravani A, Hicks RJ, Williams S, Murphy DG and proPSMA Study Group Collaborators: Prostate-specific membrane antigen PET-CT in patients with high-risk prostate cancer before curative-intent surgery or radiotherapy (proPSMA): a prospective, randomised, multicentre study. Lancet *395(10231)*: 1208-1216, 2020. PMID: 32209449. DOI: 10.1016/S0140-6736(20)30314-7

19 Kwan TN, Spremo S, Teh AYM, McHarg D, Thangasamy I and Woo HH: Performance of Ga-68 PSMA PET/CT for diagnosis and grading of local prostate cancer. Prostate Int *9(2)*: 107-112, 2021. PMID: 34386454. DOI: 10.1016/j.prnil.2020.07.008

20 Franklin A, Yaxley WJ, Raveenthiran S, Coughlin G, Gianduzzo T, Kua B, McEwan L, Wong D, Delahunt B, Egevad L, Samaratunga H, Brown N, Parkinson R, Roberts MJ and Yaxley JW: Histological comparison between predictive value of preoperative 3-T multiparametric MRI and (68) Ga-PSMA PET/CT scan for pathological outcomes at radical prostatectomy and pelvic lymph node dissection for prostate cancer. BJU Int *127(1)*: 71-79, 2021. PMID: 32524748. DOI: 10.1111/bju.15134

21 Ma L, Zhang WC and Hao YX: Current state of prostate-specific membrane antigen PET/CT imaging-targeted biopsy techniques for detection of clinically significant prostate cancer. J Med Imaging Radiat Oncol *66(6)*: 776-780, 2022. PMID: 34914195. DOI: 10.1111/1754-9485.13369

22 Demirci E, Kabasakal L, Şahin OE, Akgün E, Gültekin MH, Doğanca T, Tuna MB, Öbek C, Kiliç M, Esen T and Kural AR: Can SUVmax values of Ga-68-PSMA PET/CT scan predict the clinically significant prostate cancer? Nucl Med Commun *40(1)*: 86-91, 2019. PMID: 30395048. DOI: 10.1097/MNM.0000000000000942

23 Rüschoff JH, Ferraro DA, Muehlematter UJ, Laudicella R, Hermanns T, Rodewald AK, Moch H, Eberli D, Burger IA and Rupp NJ: What's behind (68)Ga-PSMA-11 uptake in primary prostate cancer PET? Investigation of histopathological parameters and immunohistochemical PSMA expression patterns. Eur J Nucl Med Mol Imaging *48(12)*: 4042-4053, 2021. PMID: 34386839. DOI: 10.1007/s00259-021-05501-1

24 Zhang LL, Li WC, Xu Z, Jiang N, Zang SM, Xu LW, Huang WB, Wang F and Sun HB: (68)Ga-PSMA PET/CT targeted biopsy for the diagnosis of clinically significant prostate cancer compared with transrectal ultrasound guided biopsy: a prospective randomized single-centre study. Eur J Nucl Med Mol Imaging *48(2)*: 483-492, 2021. PMID: 32734457. DOI: 10.1007/s00259-020-04863-2

25 Liu Y, Yu H, Liu J, Zhang X, Lin M, Schmidt H, Gao J and Xu B: A pilot study of (18)F-DCFPyL PET/CT or PET/MRI and ultrasound fusion targeted prostate biopsy for intra-prostatic PET-positive lesions. Front Oncol *11*: 612157, 2021. PMID: 33747927. DOI: 10.3389/fonc.2021.612157

26 Cytawa W, Kircher S, Kübler H, Werner RA, Weber S, Hartrampf P, Bandurski T, Lass P, Połom W, Matuszewski M, Wester HJ, Lapa C, Rosenwald A, Seitz AK and Buck AK: Diverse PSMA expression in primary prostate cancer: reason for negative [(68)Ga]Ga-PSMA PET/CT scans? Immunohistochemical validation in 40 surgical specimens. Eur J Nucl Med Mol Imaging *49(11)*: 3938-3949, 2022. PMID: 35556160. DOI: 10.1007/s00259-022-05831-8

27 Kalapara AA, Nzenza T, Pan HYC, Ballok Z, Ramdave S, O'Sullivan R, Ryan A, Cherk M, Hofman MS, Konety BR, Lawrentschuk N, Bolton D, Murphy DG, Grummet JP and Frydenberg M: Detection and localisation of primary prostate cancer using (68) gallium prostate-specific membrane antigen positron emission tomography/computed tomography compared with multiparametric magnetic resonance imaging and radical prostatectomy specimen pathology. BJU Int *126(1)*: 83-90, 2020. PMID: 31260602. DOI: 10.1111/bju.14858

28 Emmett L, Papa N, Buteau J, Ho B, Liu V, Roberts M, Thompson J, Moon D, Sheehan-Dare G, Alghazo O, Agrawal S, Murphy D, Stricker P, Hope TA and Hofman MS: The PRIMARY score: Using intraprostatic (68)Ga-PSMA PET/CT patterns to optimize prostate cancer diagnosis. J Nucl Med *63(11)*: 1644-1650, 2022. PMID: 35301240. DOI: 10.2967/jnumed.121.263448

29 Pepe P, Pepe G, Pepe L, Garufi A, Priolo GD and Pennisi M: Cost-effectiveness of multiparametric MRI in 800 men submitted to repeat prostate biopsy: Results of a public health model. Anticancer Res *38(4)*: 2395-2398, 2018. PMID: 29599367. DOI: 10.21873/anticanres.12489

30 Pepe P, Pepe L, Tamburo M, Marletta G, Pennisi M and Fraggetta F: Targeted prostate biopsy: 68Ga-PSMA PET/CT *vs*. mpMRI in the diagnosis of prostate cancer. Arch Ital Urol Androl *94(3)*: 274-277, 2022. PMID: 36165469. DOI: 10.4081/aiua.2022.3.274

31 Pepe P, Garufi A, Priolo G, Candiano G, Pietropaolo F, Pennisi M, Fraggetta F and Aragona F: Prostate cancer detection at repeat biopsy: can pelvic phased-array multiparametric MRI replace saturation biopsy? Anticancer Res *33(3)*: 1195-1199, 2013. PMID: 23482802.

32 Ferda J, Hes O, Hora M, Ferdová E, Pernický J, Rudnev V, Pecen L, Topolčan O and Mírka H: Assessment of prostate carcinoma aggressiveness: Relation to (68)Ga-PSMA-11-PET/MRI and Gleason score. Anticancer Res *43(1)*: 449-453, 2023. PMID: 36585198. DOI: 10.21873/anticanres.16181

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