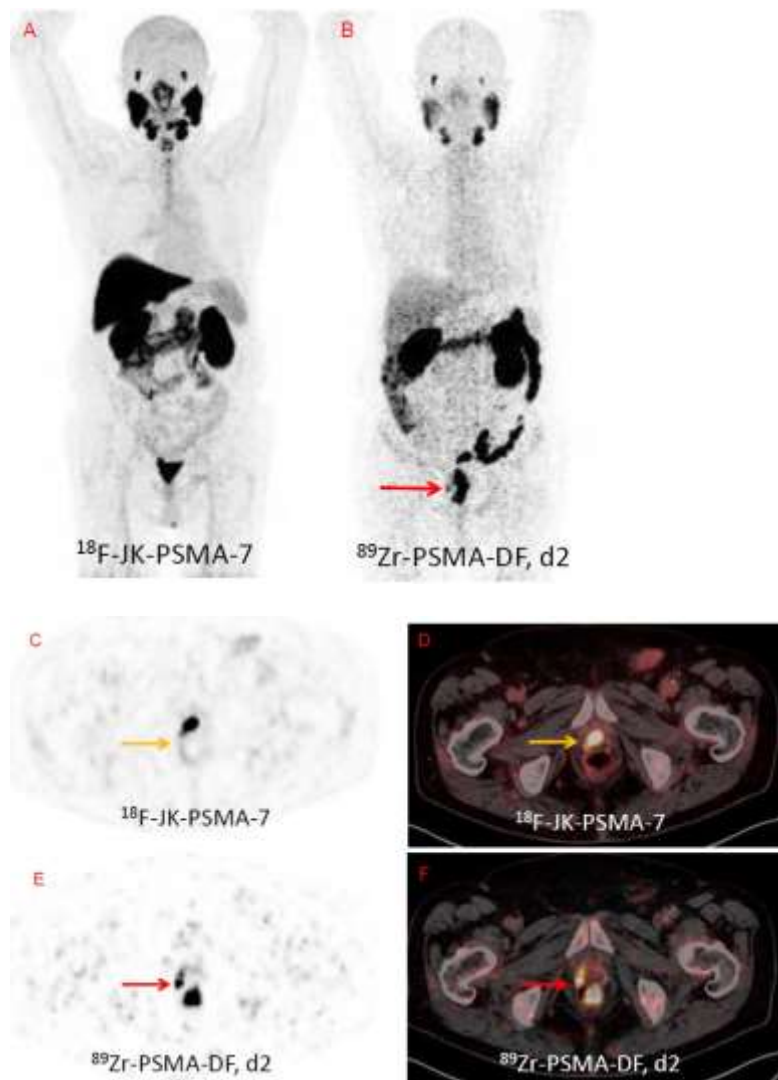**Supplemental Table 1**

Patient No.	Contrast-to-noise ratio (CNR) in the lesions interpreted as PSMA-positive with ^{89}Zr-PSMA-Df in PET-2					Corresponding area with ^{18}F-JK-PSMA-7 in PET-1	Corresponding area with ^{68}Ga-PSMA-11 in PET-1
	PET finding	d 1	d 2	d 3	d 6	2 h	1 h
1	Prostate lobe right, CNR SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg Prostate lobe left SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg		3.78 (7.25-1.13):1.62 3.48 (6.77-1.13):1.62	2.98 (7.51-2.03):1.84 1.14 (4.12-2.03):1.84		0.94 (3.30-2.24):1.13 0.59 (2.91-2.24):1.13	
2	Lung left (dignity unclear), CNR SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg		20.33 (3.81-0.15):0.18		23.74 (4.62-0.11):0.19		12.13 (2.42-0.48):0.16
3	l.n. retroperitoneal SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg l.n. retroperitoneal SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg l.n. retroperitoneal SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg l.n. supraclav. Left SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg		1.12 (2.14-0.85):1.15 8.31 (10.41-0.85):1.15 8.63 (10.78-0.85):1.15 18.78 (7.01-0.25):0.36	3.09 (4.06-0.66):1.10 6.56 (7.88-0.66):1.10 4.71 (5.84-0.66):1.10 11.91 (5.47-0.35):0.43		0.09 (1.16-1.10):0.68 1.01 (1.79-1.10):0.68 -0.16 (0.99-1.10):0.68 2.85 (1.51-0.57):0.33	
6	l.n. iliac right SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg Os ilium left SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg		11.51 (4.64-0.38):0.37 17.67 (9.88-0.34):0.54	20.58 (10.72-0.43):0.5 37.90 (11.61-0.24):0.3			3.02 (2.64-0.80):0.61 9.41 (4.87-0.54):0.46
8	l.n. retroperitoneal SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg l.n. retroperitoneal SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg l.n. supraclav. Left SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg	4.55 (6.13-1.35):1.05 3.89 (5.43-1.35):1.05 2.98 (2.49-0.79):0.57	4.92 (6.87-1.26):1.14 6.46 (8.63-1.26):1.14 3.08 (1.71-0.54):0.38		12.15 (9.52-0.71):0.75 5.51 (4.84-0.71):0.75 12.98 (6.43-0.46):0.46		0.03 (1.75-1.71):1.16 1.69 (3.67-1.71):1.16 0.65 (1.78-1.41):0.57
10	Prostate fossa right SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg		3.46 (10.50-1.91):2.48	13.22 (15.25-1.1):1.07	8.35 (7.11-0.51):0.79	-0.19 (7.43-	

						11.56):21.4
13	l.n. iliac right SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg		12.91 (5.89-0.21):0.44	8.03 (3.33-0.20):0.39		4.25 (3.46-0.78):0.63
14	Prostate fossa left SUV$_{mean}$lesion-SUV$_{mean}$bckg):SD bckg		30.83 (17.31-0.66):0.54	16.67 (11.35-0.68):0.64	-0.26 (6.53- 11.5):18.96	

Supplemental Table 1. Contrast-to-noise ratio of 15 lesions in 8 patients whose ^{89}Zr-PSMA-Df PET scans (PET-2) were interpreted as PSMA-positive. When one or several PSMA-positive areas were detected by ^{89}Zr-PSMA-Df PET, the SUV$_{mean}$ within the corresponding area of the ^{18}F-JK-PSMA-7 or the ^{68}Ga-PSMA-11 PET was measured. The contrast-to-noise ratio (CNR) was calculated as the ratio of the difference of the SUV$_{mean}$ in the lesion and the SUV$_{mean}$ in the background to standard deviation in the background. The SUV$_{mean}$ of the background and its standard deviation were measured in a 3 cm VOI in the local background around the lesion. The CNR of ^{89}Zr-PSMA-Df PET-2 (first measurement) was significantly higher than the CNR of the PET-1 scan with ^{68}Ga-PSMA-11 (p=0.0016, paired t-test) or ^{18}F-JK-PSMA-7 (p=0.036).

Abbreviations: CNR, contrast-to-noise ratio; bckg, background; d, day; h, hour; l.n., lymph node; SUV, standardized uptake value; VOI, volume of interest

Supplemental Figure 1

Supplemental FIGURE 1. ^{18}F-JK-PSMA-7 PET with MIP (A), attenuation corrected PET scan (C), PET/low-dose CT fusion image (D) and ^{89}Zr-PSMA-Df PET 2 days p.i. with MIP (B), attenuation corrected PET scan (E), PET/low-dose CT fusion image (F) of patient No. 10 with BCR after prostatectomy. Standard field salvage radiotherapy had been refused by the patient before the ^{89}Zr-PSMA-Df PET scan. The PSMA-positive relapse in the right prostate fossa is clearly visible with ^{89}Zr-PSMA-Df without the overlay of the residual activity in the urine (red arrows in B, E, F). Residual activity of ^{89}Zr-PSMA-Df is seen in the rectum. The ^{18}F-JK-PSMA-7 PET was misinterpreted as activity in the ureter, but the relapse is retrospectively also PSMA-positive with ^{18}F-JK-PSMA-7 (yellow arrow in C, D). Based on the findings of the ^{89}Zr-PSMA-Df PET scan, the patient underwent salvage-radiotherapy, and the PSA level dropped from 0.54 ng/ml to 0.3 ng/ml.

Abbreviations: d, day; MIP, maximum intensity projection; p.i.; post injection