

# <sup>89</sup>Zr-PSMA-617 PET/CT May Reveal Local Recurrence of Prostate Cancer Unidentified by <sup>68</sup>Ga-PSMA-11 PET/CT

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**Abstract:** For localization of biochemical recurrence of prostate cancer, <sup>68</sup>Ga-PSMA-11 PET/CT imaging was performed in a 66-year-old man with no suspicious findings at 1 hour p.i. Additional <sup>89</sup>Zr-PSMA-617 PET/CT revealed a small local recurrence in the prostate bed, facilitating consecutive local therapy. This interesting image points to the potential of PET/CT with <sup>89</sup>Zr-labeled PSMA ligands, for example, <sup>89</sup>Zr-PSMA-617, for identifying the source of biochemical recurrence despite otherwise negative imaging including conventional PSMA PET/CT.

**Key Words:** prostate cancer, biochemical recurrence, zirconium 89, PSMA PET/CT

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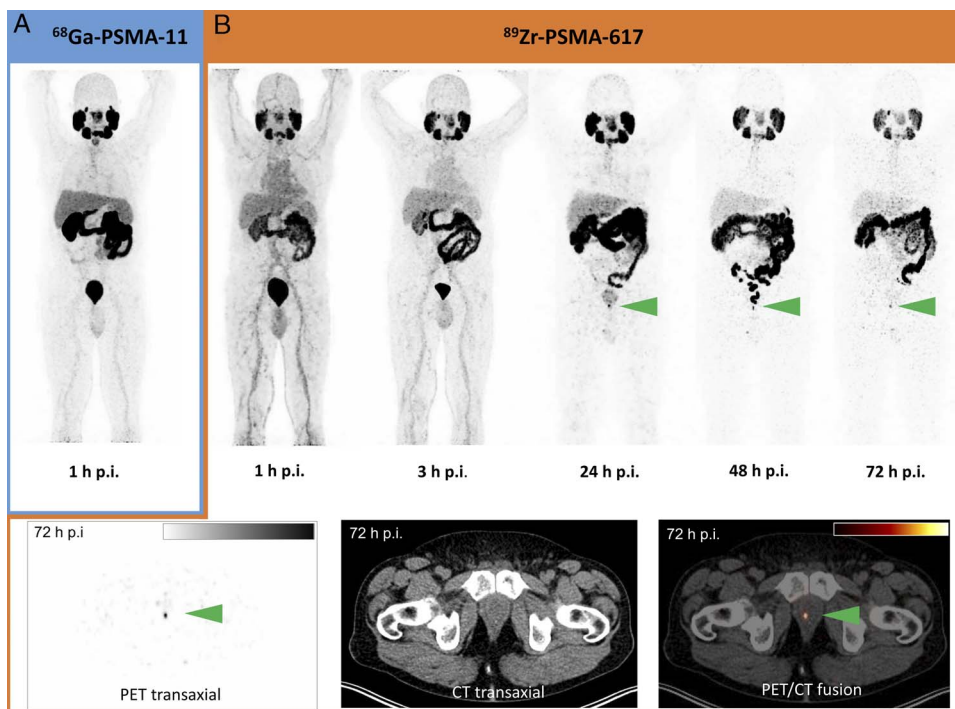
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**FIGURE 1.** Prostate-specific membrane antigen (PSMA)-targeted PET/CT was performed in a 66-year-old man due to biochemical recurrence (BCR) of prostate cancer with an increase of prostate-specific antigen (PSA) serum value to 1.9 ng/mL (doubling time, 6 months). The patient had undergone prior robotic prostatectomy with pelvic lymph node dissection for Gleason 7a prostate cancer 4 years ago. **A**,  $^{68}\text{Ga}$ -PSMA-11 PET/CT (118 MBq, acquisition time 1 hour p.i.) shows no suspicious findings. **B**,  $^{89}\text{Zr}$ -PSMA-617 PET/CT (102 MBq, acquisition times 1, 3, 24, 48, and 72 hours p.i.) reveals focal tracer uptake (arrow) in the prostate bed after 24 hours, confirmed by imaging 48 hours and 72 hours p.i. This unequivocal finding represented local recurrence of the prostate cancer, allowing accurate local therapy (external beam radiation therapy). No other suspicious findings were observed. Postradiation PSA decreased to below detection limit ( $<0.03$  ng/mL) within 1 month as evidence of a true-positive finding.  $^{68}\text{Ga}$ -PSMA-11 PET/CT is an established imaging modality for prostate cancer including localization of BCR.<sup>1</sup> In patients with BCR, negative  $^{68}\text{Ga}$ -PSMA-11 PET/CT is, however, not uncommon, depending on the Gleason score and PSA value.<sup>2</sup> The longer half-life of  $^{89}\text{Zr}$  in comparison to  $^{68}\text{Ga}$ ,  $t_{1/2} = 3.3$  d versus 68 minutes,<sup>3</sup> allows acquisition at later time points. The decreased activity in the blood pool, tissue, the bladder, and urogenital tract at later time points and consequently increasing tumor-to-background uptake ratios allows identification of lesions that are not visible at early time points usually required for  $^{68}\text{Ga}$ -PSMA-11 PET/CT due to the short half-life of  $^{68}\text{Ga}$ .  $^{89}\text{Zr}$  binds to the commonly used bifunctional chelator DOTA,<sup>4</sup> allowing the radiolabelling of PSMA-617,<sup>5</sup> an established agent for theranostics in prostate cancer.<sup>6,7</sup> A recently published study with a different  $^{89}\text{Zr}$ -labeled PSMA ligand reported similar findings as described herein.<sup>8</sup> This interesting image should encourage consideration of PET/CT with  $^{89}\text{Zr}$ -labeled PSMA ligands, for example,  $^{89}\text{Zr}$ -PSMA-617, as a complementary imaging method in the BCR setting with negative  $^{68}\text{Ga}$ -PSMA-11 PET/CT.