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Technical report

Radiotherapy for metastatic ductal adenocarcinoma of the prostate with TP53, FOXA1, and BRCA2 mutations: A case report

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ABSTRACT

Objective: To report the multidisciplinary management and favorable outcome of a patient with metastatic Prostate ductal adenocarcinoma (PRAD) who harbors co-mutations in TP53, FOXA1, and BRCA2.

Methods: A 70-year-old man presented with dysuria and a high prostate specific antigen (PSA) level (74.58 ng/ml). Imaging revealed a large prostatic tumor with seminal vesicle invasion, lymph node involvement, and extensive bone metastases. Biopsy confirmed Gleason score 9 (4 + 5) adenocarcinoma with ductal and intraductal components. Genetic testing identified pathogenic mutations in TP53, FOXA1, and BRCA2. Initial treatment with androgen deprivation therapy (ADT) plus abiraterone and radical prostatectomy achieved biochemical response. However, he later developed symptomatic iliac bone metastasis with a sharply rising carcinoembryonic antigen (CEA) level despite undetectable PSA, prompting a biopsy that confirmed metastatic PRAD.

Results: The patient received stereotactic body radiation therapy (SBRT) to the metastatic iliac and vertebral lesions, delivering a radical biological effective dose (BED_{10} = 117.6 Gy). This was followed by chemotherapy and subsequent maintenance therapy with the Poly (ADP-ribose) Polymerase (PARP) inhibitor olaparib combined with goserelin. The patient achieved sustained biochemical and radiographic remission with no disease progression at the 5-year follow-up.

Conclusions: This case highlights the aggressive nature of PRAD. The combination of high-dose SBRT and PARP inhibitor therapy, tailored to the patient's molecular profile, resulted in prolonged disease control. It underscores the importance of genetic testing and multidisciplinary precision therapy in managing advanced prostate cancer with rare histologic subtypes.

1. Background

Prostatic ductal adenocarcinoma (PRAD) is a rare subtype of prostate cancer, with an incidence rate of 0.1%–12.7%,[1,2] second to prostatic acinar adenocarcinoma (PAAC). PRAD is characterized by difficult early diagnosis, strong invasiveness, poor prognosis, and few relevant reports. This article reports a case of metastatic PRAD with TP53, FOXA1, and BRCA2 co-mutations, which was treated with urologic tumor multidisciplinary therapy (MDT) at the First Hospital of Peking University, and achieved a good therapeutic effect. In this article, we discuss its clinical features, diagnostic challenges, and treatment strategies in light of the existing literature.

2. Introduction of the case

A 70-year-old man presented with dysuria on July 5, 2020, with maximum prostate-specific antigen (PSA) level of 74.58 ng/ml. Prostate-specific membrane antigen (PSMA) positron emission tomography/computed tomography (PET/CT) revealed high PSMA expression in the prostate, with a tumor size of 5.0 cm × 3.8 cm × 4.1 cm, invading the right seminal vesicle gland; lymph node metastasis in the left internal iliac region; and metastasis in the T3, L4, and S1 vertebrae, right ilium, and bilateral pubic bone. Puncture biopsy of the prostate showed a Gleason score (GS) of 4 + 5 = 9, with 11 of 13 needle specimens showing acinar adenocarcinoma with ductal adenocarcinoma and intraductal

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