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**Comparison of the effectiveness of imaging cancer recurrence using
mpMRI and Ga68-PSMA-617 PET/CT
in patients with prostate cancer after radical radiotherapy**

Abstract

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1.1 Introduction:

Prostate cancer is one of the most common malignant tumors among men worldwide, with treatment options including external beam radiotherapy (EBRT) combined with hormone therapy. Despite technological advancements and advanced methods such as positron emission tomography with PSMA, imaging diagnosis of recurrence after biochemical recurrence (BCR) following radiotherapy, both locally and in regional lymph nodes, remains challenging. The main diagnostic methods include mpMRI and 68Ga-PSMA-617 PET/CT, with 68Ga-PSMA-617 PET/CT demonstrating high sensitivity, especially in cases of advanced cancer.

1.2 Aims:

The objective of this study was to compare the effectiveness of 68Ga-PSMA-617 PET/CT and mpMRI in detecting recurrence of prostate cancer after radical radiotherapy. It was hypothesized that 68Ga-PSMA-617 PET/CT would demonstrate higher sensitivity than mpMRI in identifying local and nodal recurrences and that the sensitivity of both methods would be influenced by PSA levels, histopathological stage (ISUP), and hormone therapy usage. The study analyzed the correlation between PSA levels and imaging parameters such as lesion size and SUV value. These findings aim to optimize diagnostic and therapeutic strategies in BCR post-radiotherapy and propose adding 68Ga-PSMA-617 PET/CT to standard diagnostics for streamlining procedures.

1.3 Materials and Methods:

The study included 297 patients who had undergone radiotherapy and met inclusion criteria, including confirmed biochemical recurrence and a maximum interval of 4 months between recurrence diagnosis and imaging studies. The analysis evaluated the sensitivity of imaging methods, lesion size, and SUV, comparing results with PSA values and ISUP grade.

1.4 Results:

The findings revealed that 68Ga-PSMA-617 PET/CT had a higher sensitivity (75.49%) than mpMRI (54.25%) in detecting biochemical recurrence of prostate cancer after radiotherapy, both locally and in regional lymph nodes. The sensitivity of 68Ga-PSMA-617 PET/CT increased with higher PSA levels and ISUP grades, reaching peak values in patients with

higher PSA levels and advanced ISUP groups. The analysis demonstrated a significant correlation between the duration of hormone therapy and imaging sensitivity in both methods, with a greater increase in sensitivity observed for 68Ga-PSMA-617 PET/CT. Additionally, SUVmax values in 68Ga-PSMA-617 PET/CT were significantly associated with PSA levels and cancer stage, influencing diagnostic sensitivity. Detection of recurrence was more effective with larger lesion diameters and higher SUVmax values.

1.5 Conclusions:

The study concluded that 68Ga-PSMA-617 PET/CT has higher sensitivity than mpMRI in identifying local and regional lymph node recurrences. Although mpMRI is less sensitive, it provides precise anatomical assessment, especially in local recurrence localization. The combination of both imaging methods is recommended for comprehensive diagnostics, particularly in cases with ambiguous results or low PSA levels. The high sensitivity of 68Ga-PSMA-617 PET/CT facilitates earlier detection of recurrence, which is crucial for treatment planning.