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CASE REPORT

Displaced bladder stone mimics primary prostate cancer/bone metastasis, requiring a SPECT/CT whole-body bone scan for accurate diagnosis

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ABSTRACT

A 69-year-old male patient diagnosed with prostate adenocarcinoma underwent whole-body bone scintigraphy utilizing [^{99m}Tc]Tc-methylene diphosphonate (MDP) for initial staging. During the procedure, an unexpected focal uptake of the radiotracer was noted, which appeared to resemble metastasis to the pubic bone or prostate cancer. However, this finding was ultimately determined to be due to a displaced bladder stone located within the prostatic urethra. This case highlights the importance of reviewing the patient's previous imaging studies, utilizing SPECT/CT imaging, and considering urinary tract stones as a potential differential diagnosis when abnormal radiotracer uptake is detected in the pelvic region below the bladder.

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INTRODUCTION

Bone scintigraphy using [^{99m}Tc]Tc-MDP is a fundamental tool in the staging and management of prostate adenocarcinoma, providing vital insights into skeletal involvement. However, its high sensitivity can sometimes lead to diagnostic challenges due to different conditions [1, 2]. Focal uptakes in the pelvic region may be erroneously attributed to bone metastases or primary calcifications related to prostate cancer, even when they represent benign entities.

Recent advancements in hybrid imaging, especially the integration of SPECT/CT have significantly enhanced our ability to localize and characterize such ambiguous findings. By fusing functional and anatomical data, SPECT/CT mitigates the limitations of planar scintigraphy alone, allowing for more precise differentiation between malignant lesions and benign conditions such as urinary tract stones.

In this context, while our case involved an incidental finding of a displaced bladder stone mimicking malignant uptake, it serves primarily as a reminder of the broader diagnostic challenges that nuclear medicine and hybrid imaging continually strive to overcome. The evolution of imaging technology is pivotal in refining our diagnostic precision, ultimately leading to better-informed treatment decisions in the management of prostate cancer and beyond.

CASE PRESENTATION

A 69-year-old male patient with a confirmed diagnosis of prostate adenocarcinoma was referred for [^{99m}Tc]Tc-MDP whole-body bone scintigraphy to facilitate initial staging. The patient's medical history includes a transrectal biopsy conducted one month prior, with no surgical interventions performed on the prostate. The anterior and posterior planar images demonstrated increased radiotracer uptake in the pubic region, located just beneath the urinary bladder (Figure 1). The more prominent uptake observed in the posterior view suggests a lower probability of metastatic involvement of the pubic bone; therefore, additional SPECT/CT imaging has been scheduled for the patient.

Trans-axial, coronal, and sagittal hybrid SPECT/CT imaging have successfully localized the observed radiotracer activity to the prostate gland (Figure 2, upper row). Corresponding low-dose CT images revealed a focal calcification at the site of increased radiotracer uptake, positioned along the midline of the prostate, which may resemble primary calcified prostate cancer (Figure 2, lower row). A review of a prior standalone abdominopelvic computed tomography (CT) scan, performed approximately one week earlier, revealed the existence of a stone within the bladder, while showing no evidence of calcification or the presence of a stone in the prostate gland area (Figure 3). These observations suggest that the urinary stone may have been displaced into the prostatic urethra. The patient has a documented history of nephrolithiasis, which necessitated surgical intervention on the right kidney several years ago; however, he has not reported any recent urinary symptoms. This case report received approval from the Ethics Committee (IR.SUMS.MED.REC.1403.692) as well as the Institutional Review Board of Shiraz University of Medical Sciences (Approval No. 32113). Additionally, informed consent was obtained from the patient who participated in the study.

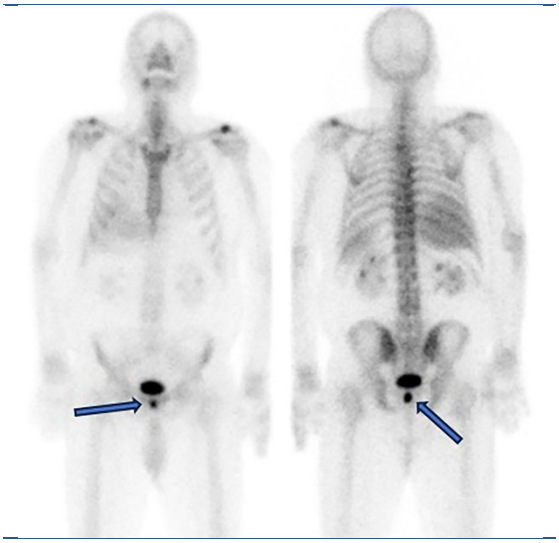

Figure 1. The anterior and posterior planar images demonstrated increased radiotracer uptake in the pubic region, located just beneath the urinary bladder. The more prominent uptake observed in the posterior view suggests a lower probability of metastatic involvement of the pubic bone; therefore, additional SPECT/CT imaging has been scheduled for the patient

DISCUSSION

Prostatic calcifications are frequently encountered in the male population and are believed to be linked to conditions such as chronic pelvic pain syndrome, prostatitis, and prostate cancer [3-6]. Historically, these calcifications were deemed clinically insignificant, and their presence was often omitted from diagnostic imaging reports [4]. A histological investigation involving 298 consecutive whole mount prostates from patients diagnosed with prostate cancer indicated that 88.6% of these specimens' contained calcifications [6]. Singh et al. demonstrated that most prostate cancers are in the

peripheral zone, and calcifications may be associated with malignancy [4]. Prostatic calcifications are commonly found within and adjacent to cancerous lesions, which could potentially influence subsequent treatment strategies [7].

On the other hand, prostatic urethral stones are infrequently encountered, representing less than 0.3% of all urinary stones, and are typically linked to conditions such as urinary stasis, infections, or previous urological disorders. Research indicates that most urethral stones are secondary in nature, arising from the migration of stones originating in the bladder or kidneys [4]. Furthermore, most studies have reported urethral stones in the posterior portion, as observed in this case [8-10].

Therefore, differentiating between these two entities is essential when interpreting bone scintigraphy in this context. A comprehensive clinical history, careful examination of previous imaging, and the use of hybrid imaging techniques can significantly reduce the risk of misinterpretation.

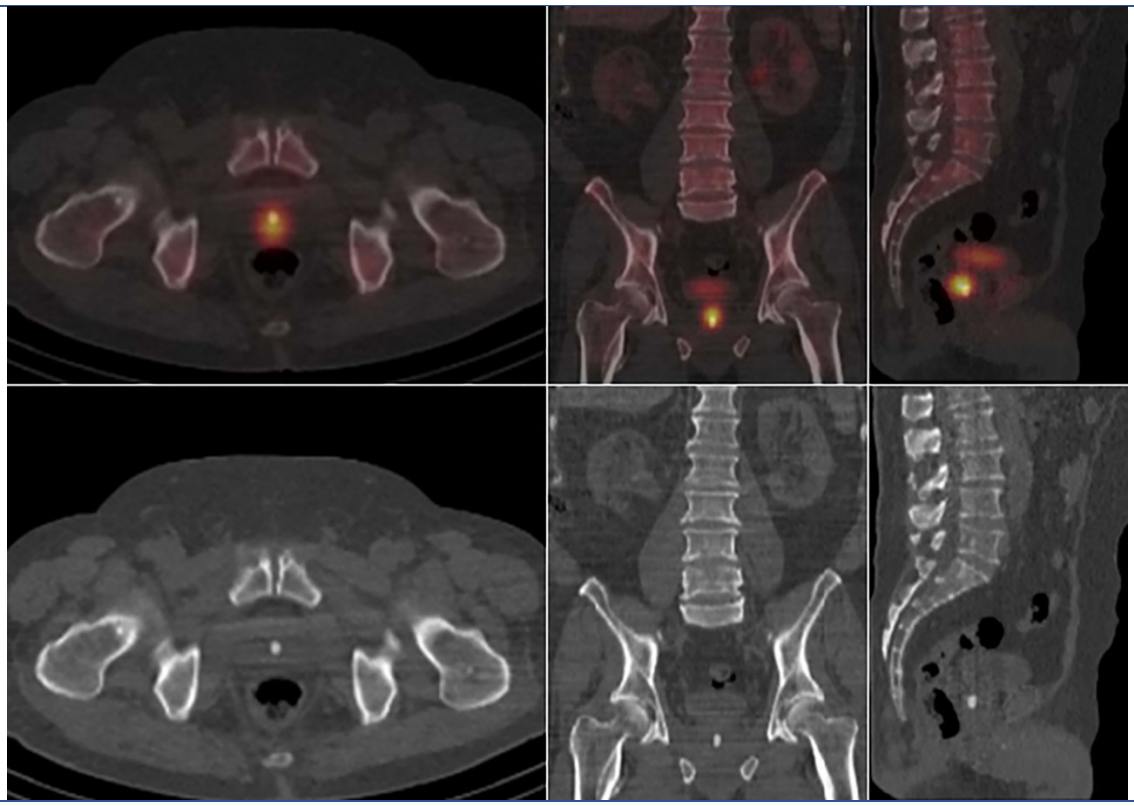

Figure 2. Trans-axial, coronal, and sagittal hybrid SPECT/CT imaging have successfully localized the observed radiotracer activity to the prostate gland. Corresponding low-dose CT images revealed a focal calcification at the site of increased radiotracer uptake, positioned along the midline of the prostate, which may resemble primary calcified prostate cancer

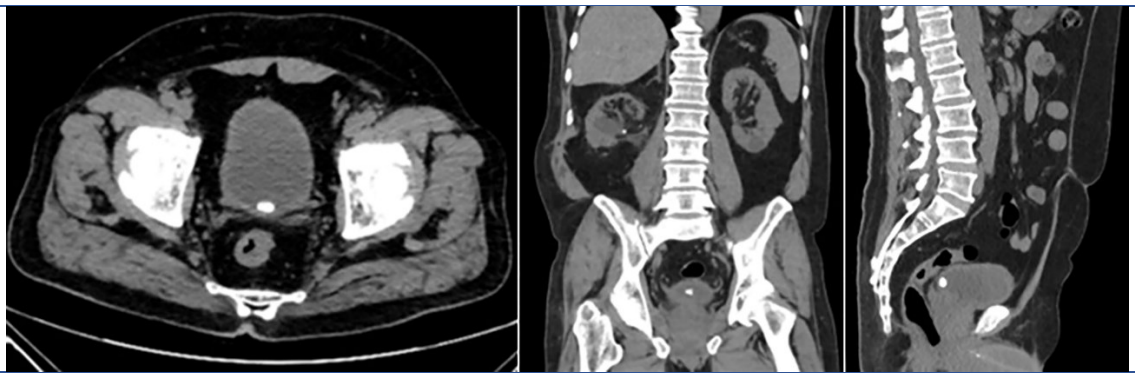

Figure 3. A review of a prior standalone abdominopelvic computed tomography (CT) scan, performed approximately one week earlier, revealed the existence of a stone within the bladder, while showing no evidence of calcification or the presence of a stone in the prostate gland area. These observations suggest that the urinary stone may have been displaced into the prostatic urethra

CONCLUSION

This case highlights the challenges of interpreting hyperactivity below the bladder on bone scintigraphy. Without careful evaluation, these findings may be misattributed to urinary skin contamination, bone metastasis, or prostate cancer uptake. Hybrid SPECT/CT provides anatomical context, improving specificity and diagnostic confidence. Comparing with previous imaging studies is also essential for accurate diagnosis.

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