Inguinal Herniation of Urinary Bladder on F-18 Sodium Fluoride (NaF) PET-CT

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Abstract Inguinal herniation of urinary bladder is uncommon and usually an incidental finding in asymptomatic patients. In some of these patients, residual urine volume and consequently, urinary tracer activity can be higher in the herniated bladder than the native bladder, in which case interpretation can be challenging on conventional planar imaging. We describe an interesting case of physiological activity in a herniated bladder simulating a “tear-drop”. This case serves an

important reminder that whilst F-18 NaF PET-CT has a similar spectrum of urinary activity to conventional bone scintigraphy; morphological correlation on hybrid imaging is invaluable in ensuring the physiological nature of uptake.

Keywords F-18 NaF PET-CT · Herniation of the urinary bladder · Hybrid imaging · Inguinal hernia

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Fig. 1 74-year old male with prostate cancer of Gleason score (4 + 3) had sodium fluoride positron emission tomography (F-18 NaF PET-CT) performed after injection of 6 mCi F-18 NaF for staging. MIP images (**a-b**) demonstrate intense uptake in the right inguinal region (arrow) which is as intense as bladder activity (dotted arrow). **c** Axial unenhanced CT demonstrates the inferior aspect of the bladder herniating through the right inguinal canal with no evidence of locoregional complications. **d** Axial fused PET-CT images show intense radiotracer uptake in the hernia sac with standard uptake value (SUV) similar to the pelvic bladder activity but these two foci are entirely separate. The inguinal column of tracer is seen tapering away from the neck, with no stagnant activity in the contracted part of the bladder (arrow, **g**). In some patients, a narrow hernia neck may lead to incomplete emptying of the herniated bladder after voiding (**e**, dotted arrow, **f**) which may result in two separate foci of urinary activity. In the current case, this configuration is best appreciated in sagittal datasets (**g-h**)

Fig. 2 (a–d) Contrast-enhanced CT images confirming the herniation of urinary bladder to the right scrotal compartment and it also shows prominent prostate gland with tiny calcifications. Bladder involvement in an inguinal hernia is infrequent, occurring in up to 4 % of cases [1, 2]. Most patients are asymptomatic and are diagnosed incidentally on diagnostic imaging [3]. They are however at increased risk of acute renal failure, traumatic rupture, fistula formation, bladder calculi, infection due to incomplete bladder emptying and rarely malignancy [4, 5]. In patients with a narrow neck hernia, incomplete emptying of the herniated part of the bladder can lead to significantly higher urinary activity levels in herniated bladder which is not continuous with the urinary bladder activity usually seen in the pelvis. This can be challenging to interpret on planar imaging alone without the aid of cross-sectional imaging. In this situation, a “tear–

drop” like activity in the inguinal region should raise suspicion for this diagnosis. F-18 NaF urinary excretion profile is similar to 99mTc-MDP, with kidneys, ureters, and bladder readily visible in the absence of renal insufficiency [6]. Owing to faster clearance from soft tissues than 99mTc-MDP, F-18 NaF images have better spatial resolution and the tear-drop configuration described above is probably more conspicuous [7]. However, observation of this configuration even on conventional planar MDP scans should elicit a suspicion of urinary activity in a herniated bladder. Whilst F-18 NaF PET-CT is not a primary modality for diagnosing bladder herniation, this case reinforces the importance of hybrid imaging in distinguishing relatively benign findings from sinister causes like nodal or skeletal metastases [8, 9]

Compliance with Ethical Standards

Conflict of Interest Sharjeel Usmani, Fahad Marafi, Najeeb Ahmed and Nafisah kazem declare that they have no conflict of interest.

Ethical Statement The study was approved by an institutional review board or equivalent and has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. All subjects in the study gave written informed consent or the institutional review board waived the need to obtain informed consent

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