Case Report

Role of the Magnetic Resonance Imaging in Diagnosis of Carsinoma Arising in Urinary Bladder Diverticula

İntradivertiküler Mesane Tümörlerinin Tanısında Manyetik Rezonans Görüntüleme Yönteminin Önemi

Hüseyin ÖZKURT [1], Işık GÜLCAN [2], Güzide TOKSOY [2]
Ender UYSAL [1], Müjdat BANKAOĞLU [1], Muzaffer BAŞAK [1]

1 . Sisli Etfal Education and Research Hospital, Department of Radiology, Istanbul, Turkiye
2 . Istanbul Bilim University Faculty of Medicine, Department of Radiology, Istanbul, Turkiye

ABSTRACT

The most frequent site for urinary tract cancers is the urinary bladder. Neoplasms originating in bladder diverticula are characterized by early transmural invasion and a tendency for higher histopathological grades which rise mortality and morbidity. The final diagnosis of bladder cancer is usually established with pathological findings provided from cystoscopy and biopsy of the lesion. Intradiverticular tumors cannot always be visualized in cystoscopy because of narrow diverticulum orifice or bladder base location of the diverticulum. These methods also cannot detect extravesical disease. Moreover, the cystoscopy procedure can cause iatrogenic injury in the urethra or bladder. Magnetic resonance (MR) imaging of the bladder provides direct multiplanar capabilities and soft-tissue contrast. MR has also capable of showing tumor existence and extend in diverticula of the bladder.

Contrast administration helps to distinguish tumor borders from the adjacent tissues. Our aim of the study was to assume the role of MR imaging in diagnosis of carsinomas arising in urinary bladder diverticula.

Keywords: *bladder carsinoma; intradiverticular tumor; magnetic resonance imaging (MRI)*

ÖZET

Üriner sistem kanserlerinin en sık yerleşim yeri mesanedir. Mesane divertikülü içinden çıkan tümörler erken transmural yayılım ve yüksek histopatolojik evre ile karakterize olup mortalite ve morbiditesi daha fazladır. Mesane kanserlerinin kesin tanısı sistoskopi ve biyopsi sonucu histopatoloji ile konur. İntradivertiküler mesane tümörleri divertikül ağzının dar olduğu durumlarda ya da divertikülün mesane tabanında yerleştiği olgularda sistoskopide gözden kaçabilir. Ayrıca bu yöntemle ekstravezikal tümör yayılımı saptanamada yetersiz olabilir ve sistoskopi yatrojenik mesane ve üretra hasarı riski taşımaktadır. Oysa Manyetik Rezonans görüntüleme (MRG) multiplanar görüntüleme kapasitesi, yüksek yumuşak doku kontrast özelliği ile intradivertiküler tümör varlığının ve yayılımının saptanmasında etkilidir.

Kontrast madde kullanılarak yapıların Manyetik Rezonans Görüntüleme tümör uzanımı hakkında ek bilgiler vermektedir. Bu çalışmadaki amacımız mesane divertikülü içinden çıkan tümörlerin tanısında Manyetik Rezonans görüntülemenin önemini vurgulamaktır.

Anahtar Kelimeler: *mesane kanseri; intradeivertiküler tümör; manyetik rezonans*

Contact
Corresponding Author: Hüseyin ÖZKURT
Address: Abdurrahman Gazi Mh. Sevenler Cd. Elysium Life Site, 1. Kısım No: 39, Samandira, Istanbul, Turkiye
Phone: +90 (505) 589 29 10
E-mail: drhozkurt@yahoo.com
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INTRODUCTION

The most frequent site for urinary tract cancers is the urinary bladder. Neoplasms originating in bladder diverticula are characterized by early transmural invasion and a tendency for higher histopathological grades which rise mortality and morbidity. The final diagnosis of bladder cancer is usually established with pathological findings provided from cystoscopy and biopsy of the lesion. Intradiverticular tumors cannot always be visualized in intravenous urography or cystoscopy. An obstructed diverticulum can remain occult during intravenous urography. Intradiverticular masses with narrow diverticulum orifice or bladder base located diverticulum may also be missed during cystoscopy (1). These methods also cannot detect extravesical disease. Moreover, the cystoscopy procedure can cause iatrogenic injury in the urethra or bladder. All of these make it desirable to investigate noninvasive alternative diagnostic methods (2, 3). Magnetic resonance (MR) imaging of the bladder provides direct multiplanar capabilities and soft-tissue contrast. MR demonstrates a difference in signal intensity aiding in gross assessment of tumor depth too. Gadolinium enhancement allows further evaluation of tumor extent and spreads to adjacent organs. MR imaging will likely prove an important role in diagnosis and staging of bladder cancer (3, 4).

Here we present MR imaging findings in a case of intradiverticular bladder neoplasm. Our aim of presenting this case is to delineate the role of MR imaging in diagnosis of carsinomas arising in urinary bladder diverticula.

CASE

A 74-year-old man was admitted to our clinic in December 2011 because of painless macrohematuria. According to the history of the patient, prostatectomy for prostatic carsinoma and postoperative radiation theraphy undergone eleven years ago was the only hint that can explain the reason of hematuria. But PSA values excluded the possibility of recurrence of the prostate carsinoma. There was no spesific laboratory finding other than hematuria. After a few additional episodes of painless gross hematuria, the patient returned to the clinic and was hospitalized for further diagnostic procedures.

The MR examination was performed with 1,5 T MRI scanner (Signa; GE Medical Systems, Milwaukee, WI), images was taken with a body coil, patient was in supine position.

The MR examination was performed with iv 10 ml Gadolinium (0,1 ml/kg dose). Precontrast; axial and coronal plane T1W, axial and sagittal plane T2 FSE sequences and postcontrast; T2 FSE axial, sagittal and coronal plane sequences were taken.

MR images identified total number of three diverticulums, right and left-sided, posterolateral and anterior located, the largest one in the right posterolateral wall measuring 3 cm in the largest diameter (Figure 1). Diverticulum in the left posterolateral side and right anterior located was with no wall irregularities or filling defects which would point to the presence of neoplasm (Figure 2).

Figure 1: Sagittal plane obtained T2 Weighted MRI image demonstrated intradiverticular tumor arising from wall of the bladder (arrow).

Figure 2: Axial plane T2 Weighted MRI image revealed an intradiverticular tumor arising from the right posterior wall of the bladder (arrow).

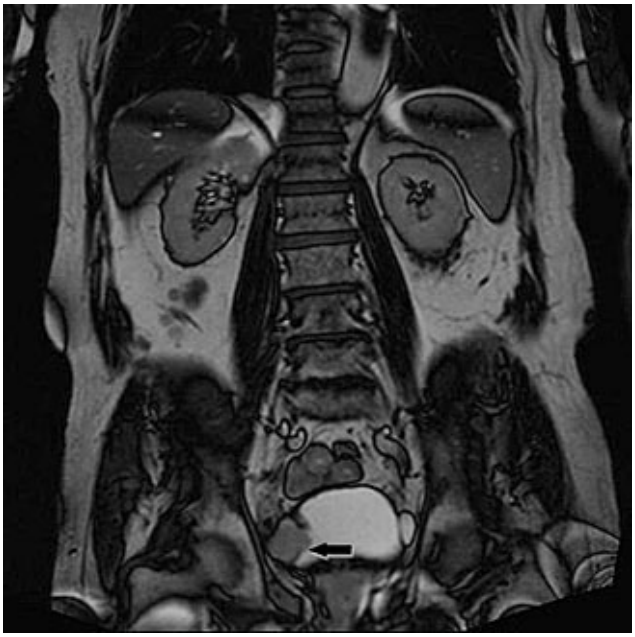

Figure 3: Coronal plane T2 weighted MRI image demonstrated 2 bladder diverticulae. The tumor was seen in the diverticula arising from right wall (arrow).

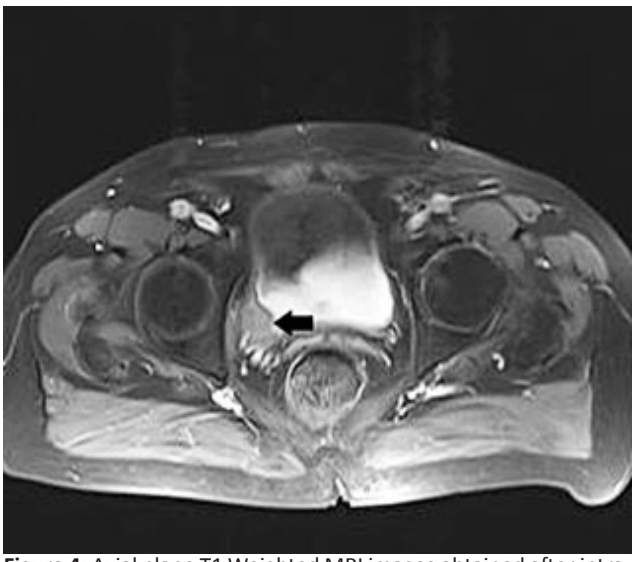

Figure 4: Axial plane T1 Weighted MRI images obtained after intravenous contrast media administration shows small amount contrast enhancement of the intradiverticular tumor (arrow).

But the diverticulum located in the right posterolateral side of the bladder had soft tissue filling defect suggesting malignancy in the first place (Figure 3-4). The diverticulum was compressing the bladder. Cystoscopy performed a few days later could not identify the cause of hematuria just pointed one diverticulum, left posterolateral located, with no signs of presence of neoplasm. Cystoscopy was repeated to confirm the presence of intradiverticular tumor which was suggested in the MR examination. Second look cystoscopy revealed a diverticulum with narrow orifice which was in the right posterolateral side of the urinary bladder, cystoscopy also confirmed the diagnosis of intradiverticular tumor obstructing the diverticulum. Diverticulectomy was performed. The specimen was sent to pathology. The result of the pathology report was high grade infiltrative urethelial carsinoma. The tumor invaded lamina propria and muscularis propria layers of diverticulum wall with no extension to the perivesical fat. The patient was discharged from the hospital with full recovery.

DISCUSSION

Urinary bladder diverticulae are outpouchings of bladder mucosa through weakened muscular areas of the bladder wall. They are mostly acquired, developed secondary to the increased intravesical pressure in patients with urethral or bladder neck obstruction and in patients with neurogenic bladder (5). There is a well documented relationship between urinary bladder diverticula and intradiverticular neoplasms. The prevalance is reported as 1-10% (6, 7). It seems that urinary stasis produces chronic mucosal irritation and prolonged exposure to urinary carcinogens, which could explain predisposition to malignant transformation of diverticular urothelium (7- 9). Urinary stasis with chronic infection and inflammation leads to the development of dysplasia, leukopiakia, and squamous cell metaplasia in approximately 80% of all diverticula (10), these histologic abnormalities may explain the increased risk of neoplasia in bladder diverticulums. Shinai et al. (11) stated the prevalance of histologic types of intradiverticular tumors as transitional cell carcinoma (78%), followed by squamous cell carcinoma (17%), combination of transitional and squamous cell types (2%), and adenocarcinoma (2%) . The poor prognosis of intradiverticular neoplasms is a result of difficulty in diagnosis and early invasion seen in this type of neoplasms. The lack of muscular fibers in a diverticulum allows tumor invasion to proceed earlier and more easily in the perivesical tissue than in a normal bladder wall containing normal muscle tissue (1, 6, 9, 12, 13). In general, all diverticula should be regarded as potential sources of hidden neoplasms and all diverticula should be inspected carefully during cystoscopy (14, 15). Painless hematuria is the cardinal symptom for diverticular tumors, as in ordinary bladder tumors. According to Melekos et al. (6) , hematuria was present in 87.5% of patients with neoplasms occurring in the diverticula and in 100% of patients with bladder tumors nondiverticular sited. The most usual examination of patients with vesical diverticular neoplasms often consists of excretory urography and conventional cystoscopy. The final diagnosis of bladder cancer is usually established with pathological findings provided from cystoscopy and biopsy of the lesion. Intradiverticular tumors cannot always be visualized in intravenous urography or cystoscopy.

An obstructed diverticulum can remain occult during intravenous urography. Intradiverticular masses with narrow diverticulum orifice or bladder base located diverticulum may also be missed during cystoscopy (1). These methods also cannot detect extravesical disease. There are several disadvantages of conventional cystoscopy. First of all it is an invasive method performed under local or general anesthesia (16, 17). Moreover, the cystoscopy procedure can cause iatrogenic injury in the urethra or bladder. All of these make it desirable to investigate noninvasive alternative diagnostic methods(2,3). Also there is a 5% to 10% risk of urinary sepsis due to this procedure (18). Radiological imaging methods are therefore used to get more reliable results for diagnosis and staging of the invasive tumors and to determine the best course of treatment (19, 20). Song et al.(20) reported that instead of imaging the tumor, the primary role of cross-sectional imaging methods is to determine the perivesical fat tissue invasion of the tumor that was established with clinical data and endoscopic methods and to determine whether any metastasis exists in the peripheral tissues and pelvic lymph nodes. Other radiographic techniques, such as diverticulography, retrograde cystography, and double-contrast cystography, can also be used to help detect this disease (10). More recently, sonography, CT, and MR imaging have provided excellent means for identifying the presence and extent of vesical diverticular neoplasms (1).

Dondalski et al. (1) declares that the most common radiographic finding of a diverticular tumor is an intraluminal filling defect. On excretory urograms and retrograde cystograms, diverticular neoplasms may also appear as foci of mucosal irregularity, an incompletely filled diverticulum, or nonvisualization of a previously identified diverticulum (13, 21). Sonognaphy is a useful diagnostic tool for evaluation of intradiverticular neoplasms. It is particularly helpful in those patients in whom either cystoscopy is contraindicated or radiographic contrast examinations are unsuccessful. Diverticular neoplasms are often seen on sonograms as a hyperechogenic, nonshadowing mass or thickening of the wall of bladder diverticulum. However, it may be difficult to detect diverticula located along the dome or in the neck of the bladder in sonography (22) .

Diverticular neoplasms have a wide range of CT manifestations. Neoplasm may be seen as an intradiverticular sessile or pedunculated soft-tissue mass projecting into the diverticular lumen, focal or diffuse thickening of the diverticular wall. Dystrophic calcifications may occur within these tumors. Areas of hemorrhage and necrosis may also be present. Early peridiverticular tumor extension can be seen as invasion and lost of the pelvic fat planes surrounding the neoplasm. In more advanced disease, a soft-tissue mass extends from the diverticulum into adjacent soft tissues. Metastases to pelvic lymph nodes and distant metastases are also well shown by CT (1). An irregular interface, haziness, or stranding of the perivesical fat suggests tumor spread (17). Matta et al. (23) proclaim the role of CT in staging of the disease is limited in determining the depth of mural invasion of the bladder wall by its inability to resolve the different layers of the bladder wall.

Multiplanar imaging capasity and excellent soft-tissue contrast resolution are advantages of MR imaging that provide accurate diagnosis of both the primary bladder neoplasm and extravesical tumor extension(23, 4). MR imaging has also been useful in determining the depth of mural invasion of the bladder wall. This may be enhanced further by IV contrast agent use (23). Both T1 - and T2-weighted spin-echo pulse sequences should be used. On T1-weighted images, tumors appear higher in signal intensity than urine, this difference in signal intensity helps to define the intraluminal tumor component. The hyperintense T1 characteristics of perivesical fat provide excellent delineation of extravesical neoplastic infiltration because of the lower signal intensity of tumor. Tumor extension outside the urinary bladder may also be well visualized with the use of fat-suppression techniques.

On T2-weighted images, the bladder wall remains of intermediate signal intensity, whereas tumor has moderately increased signal intensity and urine becomes hyperintense. These differences in T2 tissue characteristics usually improve tumor definition. lntermediate-TR/short-TE sequences have also been found helpful for imaging superficial neoplasms because of signal-intensity differences among urine, bladder wall, and tumor (24). In recent studies, significant tumor enhancement has been shown on gadopentetate dimeglumine-enhanced T1-weighted images (25, 26). Tachinoba et al. (25) reported that fast-spin-echo gadopentetate dimeglumine-enhanced scans allowed differentiation between superficial and muscle invasion caused by these tumors. As with CT, lymphadenopathy is reliably detected on MR images only when the nodes are enlarged. Tumor extension into adjacent organs and distant metastases are well visualized on MR images.

In general if distant metastases or local perivesical invasion is absent, the treatment of local intradiverticular neoplasm is diverticulectomy. But also to avoid tumor cell seeding and local recurrences, Cheng at al. (27) recommended total cystectomy rather than simple diverticulectomy in rare and more aggressive cases where the preoperative intradiverticular sarcoma or carsinosarcoma diagnosis is established.

In our case which corresponds to the existing literature, MR identified the carsinoma arising in the diverticulum, provided enough information about the local invasion and confirmed that there were no distant metastases. These information allowed the operation to be limited to diverticulectomy reducing the mortality and morbidity of a massive surgery. MR also identified one more diverticulum which was not seen in cystoscopy. We assume that the narrow orifices of the diverticulums and obstruction with the papillary neoplasm were the main reasons of the negative cystoscopy in our case. In summary; Intradiverticular tumors cannot always be visualized in cystoscopy because of obstruction caused by the neoplasm, narrow diverticulum orifices or bladder base location. Cystoscopy also cannot detect extravesical disease. Moreover, the cystoscopy procedure can cause iatrogenic injury in the urethra or bladder, and also there is a risk of urinary sepsis due to this procedure. All of these make it desirable to investigate noninvasive alternative diagnostic methods. In this point radiological imaging methods are therefore used to get more reliable results for diagnosis and staging of the invasive tumors and to determine the best course of treatment. We believe that CT would identify the neoplasm and provide enough information about distant metastases. But because of the soft-tissue contrast resolution of MR, CT wouldn't be able to provide accurate diagnosis of the depth of mural invasion of the bladder wall. Also the radiation exposure in CT is a negativeness comparing with MR.

We believe that the role of MR in the diagnosis of neoplasms arising in bladder diverticulums will develop as its use becomes more common.

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