Gallbladder Metastasis from Renal Cell Carcinoma: A Case Report with Review of the Literature

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We experienced a rare case of gallbladder metastasis from renal cell carcinoma (RCC). Ultrasound, computed tomographic, and magnetic resonance findings showed a hypervas-cular polypoid mass and correlated well with histopathologic findings. The mass showed high intensity on diffusion-weighted images, and the apparent diffusion coefficient was relatively low. These imaging findings are considered characteristic and may assist preoperative diagnosis in patients with history of RCC.

Keywords: gallbladder, metastasis, MRI, PET-CT, renal cell carcinoma

Introduction

Metastasis to the gallbladder is rare and found by chance in autopsy in most cases.1,2 Its rarity and clinical similarity to benign gallbladder diseases can make correct diagnosis difficult in a clinical situation.

Cancers of the kidney account for 4% of all newly diagnosed malignancies in men and 3% in women, and most are renal cell carcinomas (RCCs).3 Approximately one-third of patients with RCC present with metastasis at the time of diagnosis, frequently in such vascular-rich organs as the lung and liver. Metastases to the gallbladder are reported sporadically, but clinical cases are extremely uncommon. To our knowledge, only one report correlates magnetic resonance (MR) imaging and pathologic findings of gallbladder metastasis from RCC,4 and no report has described its diffusion-weighted imaging findings.

We report a rare case of gallbladder metastasis from RCC and illustrate and discuss the correlation of imaging and pathologic findings.

Case Report

A 43-year-old man underwent a right nephrectomy for RCC approximately one year ago. The tumor was 8.7 cm in diameter and confined to the capsule of the kidney. Examinations including whole-body computed tomography (CT) and bone scintigraphy at surgery demonstrated no evidence of distant metastasis.

A surveillance follow-up CT scan revealed a gallbladder lesion. No symptom suggested cholecystitis, and the only remarkable change in blood examination was a slight elevation in levels of aspartate transaminase (AST) and alanine transaminase (ALT). Contrast-enhanced CT disclosed a polypoid mass of 26 mm with high attenuation. On the coronal reconstruction image, attenuation was inhomogeneous in the mass and relatively higher in the wall side (Fig. 1).

Ultrasonographic (US) scan showed the mass at the body of the gallbladder. Its surface was smooth, and the inner echo was slightly inhomogeneous. Color Doppler US images revealed blood flow sig-
Coronal T2-weighted MR images showed an ovoid mass of high intensity protruding into the lumen and a stalk attached to the gallbladder wall (Fig. 3a). T1-weighted MR images showed the mass with low intensity and its rim with high intensity (Fig. 3b). After gadolinium administration, enhancement of the mass was intense and heterogeneous (Fig. 3c). On diffusion-weighted images, the mass showed high intensity (Fig. 3d), and the apparent diffusion coefficient (ADC) was relatively low ($1.09 \times 10^{-3}$ mm$^2$/s) (Fig. 3e).

Fluorine-18 deoxyglucose positron emission tomography (FDG-PET)/CT study showed diffuse FDG accumulations in the gallbladder mass; the maximum standardized uptake value (SUV) was 4.7, and there was no significant accumulation in any organ other than the gallbladder.

Based on these image findings and the patient’s medical history, we initially thought the gallbladder mass metastasized from the RCC. The possibility that the tumor was a primary cancer remained, and we performed extended cholecystectomy to confirm diagnosis and perform adequate treatment. The isolated preparation showed a pedunculated tumor at the body of the gallbladder, and the surface of the tumor appeared black as a result of bleeding (Fig. 4). Microscopically, we observed prominent vascular proliferation in the stalk and basal part of the tumor (Fig. 5a). The tumor was hypercellular and composed of clear cells arranging in funicular or alveolar growth with vascular interstitial tissue (Fig. 5b). The surface of the tumor was covered by epithelium, and remarkable hemorrhage was found under the surface (Fig. 5c). The histopathologic characteristics coincided with those of the renal tumor resected one year earlier.

**Discussion**

The gallbladder is a rare site of distant metastasis, and in most such cases, the primary tumor is a malignant melanoma. To our knowledge, 34 cases of gallbladder metastasis from RCC have been reported in the English literature, and these are summarized in Table. In such cases, the lesions are usually asymptomatic and detected primarily at imaging or autopsy. There seems to be no gender...
predominance, and the average interval between the detection of RCC and gallbladder metastasis is 3.7 years. Most reported cases were pedunculated and not associated with gallstone.

The low incidence of gallbladder metastasis and its symptoms that mimic benign gallbladder diseases may make early diagnosis problematic, but 2 unique imaging points are recognized in gallbladder metastases from RCC when we compare them to cases of primary tumors. First, gallstones do not usually accompany metastatic gallbladder tumors from RCC, though the primary cancer often coexists with gallstones. Second, hematogeneous metastases to the gallbladder usually develop as serosal implants and grow progressively as pedunculated masses. Although the nature of the tumor’s polypoidal shape is unknown, we also detected this morphological characteristic on CT and MR imaging in the present case. We believe these findings can support preoperative differential diagnosis.

Color Doppler US is an important complementary technique for differential diagnosis because the detection of flow signals indicates the lesion is expansive and rules out biliary sludge or cholesterol polyps. In our case, blood flow signals in the wall side of the mass correlated with prominent vascular

Fig. 3. (a) T2-weighted coronal magnetic resonance (MR) image shows an ovoid mass protruding into the lumen and a stalk (arrow). (b) The signal of the mass was of low intensity and demonstrated a rim of high intensity on T1-weighted axial MR image and (c) heterogeneous high intensity on postcontrast image. (d) Axial diffusion-weighted image at b = 1000 s/mm² demonstrates a mass of high intensity (arrow) at the corresponding site. (e) The axial apparent diffusion coefficient (ADC) map demonstrates a hypointense mass (arrow) with a value of $1.09 \times 10^{-3}$ mm²/s.

Fig. 4. The surgical specimen shows a black pedunculated tumor at the body of the gallbladder.
proliferation in the stalk and basal part of the tumor. Relative higher attenuation in the tumor wall side on contrast-enhanced CT may reflect this vascular proliferation. T1-weighted MR findings also correlated with the histologic appearance. A rim of high intensity on T1-weighted image corresponded to marked subepithelial hemorrhage. Hypervascularity and intratumoral hemorrhage are well known characteristic findings of RCC, so these modalities may be useful in providing the key image suggesting RCC metastasis.

Five previous reports documented MR findings of gallbladder metastasis from RCC but identified no characteristic MR finding. We believe this is the first report of diffusion-weighted images of gallbladder metastasis from RCC. Previous studies have suggested significantly lower apparent diffusion coefficient (ADC) values of gallbladder carcinoma than benign gallbladder lesions. In our case, the ADC map demonstrated relative hypointensity with a value of $1.09 \times 10^{-3} \text{ mm}^2/\text{s}$, which is comparable to the mean ADC values of gallbladder carcinoma in previous reports. Diffusion-weighted images might have additive value for differentiating gallbladder metastasis from benign gallbladder lesions.

Only one report has described the use of PET/CT scans to detect gallbladder metastasis from RCC; Kawahira and colleagues documented the indication of a tumor mass at the gallbladder wall on PET/CT images without high accumulation of FDG. Although our PET/CT study showed mild FDG accumulations, the role of PET/CT for gallbladder metastasis from RCC remains indolent.

At the time of diagnosis, most patients with gallbladder metastasis have widespread disease, with multi-organ metastases, and survival is poor. In a few patients, however, like ours, the gallbladder may represent the first metastatic site. It seems that patients with RCC and solitary metastasis to the

Fig. 5. (a) Low power view shows a pedunculated mass with marked hemorrhage under the surface of the protruding portion. Note prominent vascular proliferation in the stalk (inset). (b) High power view reveals clear tumor cells arranging in alveolar fashion with vascular interstitial tissue. (c) The surface of the tumor is covered by gallbladder epithelium.
Table. Reported cases of gallbladder metastasis from renal cell carcinoma

<table>
<thead>
<tr>
<th>Author</th>
<th>Sex</th>
<th>Age when detected (years)</th>
<th>Symptom</th>
<th>Imaging/Macroscopic findings</th>
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<td>Gallbladder metastasis</td>
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N/A, not available; Syn, synchronous

*no symptom due to gallbladder metastasis
†Cited by Chung PH et al.⁸
gallbladder benefit from resection of the lesion, usually by way of laparoscopic cholecystectomy. Ishizawa’s group reviewed patients with metastatic RCC of the gallbladder and reported that approximately 40% of cases remained free of recurrent disease after cholecystectomy, with the longest follow-up interval being 6 years. Thus, it is important that patients with metastasis isolated to the gallbladder are diagnosed correctly and at an early stage.

In conclusion, we described a rare case of gallbladder metastasis from RCC. In patients with history of RCC, observation of a vascular-rich polypoid lesion of the gallbladder and low ADC value on MR imaging should suggest the possibility of metastasis.

References

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