Metastatic Renal Tumor Originating from Hepatocellular Carcinoma: a case report

CHUN-HAN LIN1 JEN-I HWANG1 SIU-WAN HUNG1 HAO-CHUNG HO2 PO-CHEUNG KWAN3
CLAYTON CHI-CHANG CHEN1

Department of Radiology1, Division of Urology2 and Department of Pathology3, Taichung Veterans General Hospital
College of Medicine4, College of Medical Science & Technology5, Chung Shan Medical University

Secondary malignant tumors of the kidney are uncommon, especially originating from hepatocellular carcinoma. We reported a case of secondary renal tumor from hepatocellular carcinoma and reviewed literatures about this rare presentation and the characteristics of secondary renal tumors. The clinical symptoms and signs including flank pain and hematuria are critical for early detection of metastatic or primary tumor of kidney. However, most of these renal tumors are eventually proven to be primary renal cell carcinoma (RCC). The image features of metastases are small size, multifoci and bilateral. Furthermore, the enhancing pattern and the growth rate are also very helpful. However, it is still very difficult to differentiate a metastatic renal tumor from a primary one. Nevertheless, the possibility of metastatic tumors should always be kept in mind.

Metastatic tumor of kidney is rare. As the applications of ultrasound and computed tomography (CT) are increasing, incidental finding of a metastatic tumor of kidney become usual. Renal metastases of patients with history of cancer may mimic primary renal tumors. When the kidney is the only known pathological site of patients with local controlled disease, the differentiation between renal metastases and primary renal cell carcinoma (RCC) may be little. This study presented the image features and characteristics of secondary renal tumor, and a brief review of literatures of metastatic renal tumors from primary hepatocellular carcinoma (HCC).

**CASE REPORT**

A 65-year-old man presented with a history of bilateral renal stones since he was 27-year-old. CT scan of abdomen revealed a hepatic mass measured about 1.1cm in size over S4 of liver on 2004, however, he refused to receive liver biopsy.

CT scan of abdomen in March, 2007 revealed mild increased size of the tumor at S4, about 1.8cm in size, and another new tumor measured about 3cm in size over S6. The level of Alfa-fetoprotein (α-FP) was 16.65ng/ml. Segmental hepatectomy was performed and pathology showed HCC. CT follow-up three months later showed recurrent tumor over S6 of liver. The level of α-FP was 10.11 ng/ml. Another segmental hepatectomy was performed and confirmed to be HCC.

The follow-up α-FP was 6.22ng/ml (within normal range). However, right flank pain occurred in January, 2008. He went to the local hospital where ureteral stone was diagnosed. Hence, he received extracorporeal shock wave lithotripsy (ESWL) and double J catheter insertion in right ureter. Persisted right flank pain and gross hematuria were noted. He visited our ER where abdominal CT revealed right renal mass (Fig. 1). CT-guided renal biopsy
was performed, which revealed metastatic poorly differentiated carcinoma of right kidney. Radical nephrectomy was performed and pathology showed metastatic HCC of right kidney. Right adrenal gland, right psoas muscle and ascending colon were also involved.

**DISCUSSION**

HCC is the most common malignant tumor of the liver [1]. Intrahepatic metastasis occurred early in the disease, and more than half of these tumors metastasize to extrahepatic sites, usually in the lungs, adrenals or regional lymph nodes; however, metastasis to kidney is rare. Extrahepatic metastasis of primary liver cancers occurs via three routes: haematogenous (56%), lymphogenous (27%), and direct invasion (22%) and more than one mode of spreading may be present at one time. Primary tumors of the lung, breast and gastrointestinal tract are the most common sources of renal metastasis. Other sources include the cervix, prostate, gallbladder, thyroid, ovary, testis, urinary bladder, contralateral kidney and bone. Because of the vascularity of the glomeruli, the renal cortex is an ideal area for entrapment and proliferation of tumor emboli, thus, the kidneys

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**Figure 1.** A mass in right kidney on CT study. **a.** Pre-contrast. **b.** Arterial phase. **c.** Venous phase. The circles are various area marked for measurement of different part of region of interest (ROI); “k” represents normal renal cortex; “t” represents tumor and “n” represents necrotic part of tumor. Note that the tumor has no contrast enhancement on arterial phase but with delayed enhancement on venous phase (data showed in Table 1).

**Figure 2.** A dynamic CT study in a case with pathologically proved conventional type RCC. **a.** Pre-contrast. **b.** Arterial phase. **c.** Venous phase. The white circle represents the ROI for measurement of CT number of the tumor. The black circle is the ROI for measurement of CT number of the renal cortex. Rapidly filling-in and quick washed-out picture is commonly found in RCC.
are a common site for hematogenous metastases [2].

Most renal metastases are clinically silent [3]. However, our patient developed flank pain and gross hematuria although it may be the sequelae after ESWL. Urine cytology examination is simple and non-invasive, however, it is still a controversial investigation that has gained a few enthusiastic supporters among pathologists while there is a false negative rate of approximately 20% [4]. Our patient had received urine cytology examination for four times but all showed negative result. Hence, negative urine cytology result cannot exclude a renal malignancy including a metastasis.

There are many advantages of ultrasonography such as cheap, non-invasiveness, and radiation-free, however, CT is still the most sensitive modality for detecting renal metastasis. Metastasis can be quite subtle on non-contrast enhanced CT scan but become more apparent after intravenous administration of contrast agent [5].

For a patient with underlying malignancy, it is important to differentiate whether a newly found renal malignancy is primary or secondary. Pagani found that among six patients with preexisting non-lymphomatous or non-renal tumors whom developed a new renal mass, five of them turned-out to be RCC [6]. Mazeman et al. found that of 295 malignant renal tumors, only eight of them were secondary [7]. Hence, when a new renal mass is found in a patient, the possibility of primary malignancy is higher than metastasis. It may be difficult to differentiate secondary renal tumor from primary RCC. Metastases to kidney are usually small, multifoci, and bilateral. Less than 2% of RCCs may also display the above pattern [8, 9]. Large, unilateral, exophytic metastasis can mimic RCC, although invasion of the renal vein and inferior vena cava is less likely as RCC [10].

Metastases usually have higher density (20-40HU) on pre-contrast CT and may show enhancement (increase 5-15HU) after intravenous administration of contrast agent [11]. Density measurement is quite difficult in a very small lesion due to partial volume effect, which is usually the case in a small metastatic tumor to the kidney. In our case, the right renal mass measured 45HU on the pre-contrast CT scan, no contrast enhancement on arterial phase, but delayed enhancement (80HU) on venous phase (Table 1). We compared the CT study of our case with a pathologically proved conventional type RCC, which showed strong contrast enhancement on arterial phase and rapid wash out on venous phase (Fig. 2). The enhancing pattern between the RCC case for comparison and our case is quite different (Table 1, 2). Although the venous phases of the two tumors present similar contrast enhancement, RCC shows a higher peak enhancement than metastatic tumor on arterial phase with tumor to cortex ratio (Table 1, see definition) of RCC above 50%. The trend of enhancement index (Table 2, see definition) of these two tumors shows the similar results. Furthermore, the ratio of enhancement index of metastatic tumor to normal cortex (Table 2) is lower on arterial phase (below 50%) and higher on venous phase (above 50%), while the RCC shows a reverse pattern. Hence, the arterial phase may be very helpful in differentiating the primary and secondary

| Table 1. CT number and tumor to cortex ratio of various tumors. |
|-----------------|-----------------|-----------------|
|                 | Pre-contrast (HU)| Arterial phase (HU) | (Venous phase) (HU) |
| Metastatic tumor (Fig.1) | Tumor | 45 | 45 | 80 |
|                  | Necrotic area | 25 | 25 | 36 |
|                  | Renal cortex | 55 | 109 | 111 |
|                  | Tumor/cortex | 81.8% | 41.3% | 72.1% |
| Small mets (Fig.3) | Tumor | 32 | 84 | 104 |
|                  | Renal cortex | 34 | 170 | 155 |
|                  | Tumor/cortex | 94.1% | 49.1% | 67.1% |
| RCC for comparison(Fig.2) | Tumor | 33 | 244 | 80 |
|                  | Renal cortex | 23 | 301 | 112 |
|                  | Tumor/cortex | 143.0% | 81.1% | 71.4% |
tumor of kidney. Unfortunately, the arterial phase is not always performed in a regular examination of renal tumor.

Tracking back the patient’s history, by comparing of the last CT study three months ago, the mass was measured about 4 mm in size (Fig. 3). With regard to the growth rate of tumor, HCC is considered to have a faster growth rate than RCC. RCC demonstrated a mean growth rate of 4 mm yearly (median 3.5 mm, range 4.2 to 16 mm) [12]. However, HCC may have various doubling time ranged from 27.2 to 605.6 days [13]. In our case, the renal tumor grew up from 4mm to 55 mm within three months. According to the growth rate of RCC, it is probably a metastatic tumor to kidney rather than a primary RCC.

**CONCLUSION**

A metastatic renal tumor originating from HCC is very rare. The clinical symptoms and signs including flank pain and hematuria may help us to
have an early diagnosis while urine cytology or α-FP may show false negative. CT is recommended for the detection of renal tumor because of its higher sensitivity for small lesions, better ability to depict other areas of tumor extension, and its enhancement capabilities. Most of the renal malignancies are eventually proved to be primary RCC. It may be difficult to differentiate secondary renal tumor from primary RCC, but there are still some clues in CT imaging. Most of renal metastases are small in sizes, multifoci, bilateral and the enhancing pattern are different from RCC especially on arterial phase. The growth rate may also be very helpful since RCC grows slower. In facing the imaging diagnosis of a renal tumor, metastasis to kidney should always be included in the differential diagnosis.

REFERENCE

轉移至腎臟之肝臟原發性細胞癌：病例報告

林群翰 1  黃振義 1,4  熊小潼 1,5  賀昊中 2  關寶祥 3  陳啟昌 1

台中榮民總醫院  放射線部 1  外科部泌尿外科 2  病理部 3
中山醫學大學  醫學系 4  醫學影像暨放射科學系 5

轉移至腎臟的腫瘤很少見，尤其是肝臟原發性細胞癌的轉移。此病例是一個轉移至腎臟的肝臟原發性細胞癌，我們會報告其特性，並收集相關期刊資料作討論。後背痛和血尿是腎臟腫瘤常見的臨床表徵，這些症狀有助於提早發現並作進一步治療，轉移至腎臟的腫瘤亦有相同的表徵，但通常較小、常多發性、且常雙側性。除此之外，腫瘤的生長速度及電腦斷層的顯影狀況都能幫助我們分辨轉移性腫瘤與原發性腎細胞癌。雖然大部分意外發現的腎臟腫瘤最後診斷以腎細胞癌最多，然而我們依然要把轉移至腎臟的腫瘤放在鑑別診斷之中。