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Gallium-67 uptake in Bellini duct carcinoma of the kidney

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Bellini duct carcinoma is a rare variant of renal cell carcinoma and usually has a poor prognosis. In this article, we report the Gallium-67 citrate (Ga-67) uptake in Bellini duct carcinoma. To our knowledge, this is the second reported case of Bellini duct carcinoma in which Ga-67 uptake was positive. We suggest that Ga-67 scintigraphy has potential utility in detecting Bellini duct carcinoma of the kidney. And if a hypovascular tumor of the kidney shows Ga-67 uptake, Bellini duct carcinoma should be included in the differential diagnosis.

Key words: Bellini duct carcinoma, gallium-67 citrate, renal cell carcinoma

INTRODUCTION

BELLINI DUCT CARCINOMA has been identified as a new entity in the spectrum of renal cell carcinoma. Primary epithelial tumors of the kidney are generally recognized as either transitional cell carcinoma arising in the renal pelvis or as renal cell carcinoma arising in the proximal convoluted tubule.[1] Bellini duct carcinoma is a very rare variant of renal cell carcinoma originating in the collecting tubules of the kidneys.[2]

To our knowledge, only one paper has previously reported Gallium-67 citrate (Ga-67) scintigraphy findings of Bellini duct carcinoma of the kidney. We present and assess the imaging findings of Bellini duct carcinoma.

CASE REPORT

A 63-year-old woman had a history of urolithiasis. She underwent abdominal computed tomography (CT) at a local hospital for follow-up of urolithiasis. CT demonstrated a right renal mass and she was referred to our hospital for further investigation. Laboratory examination including cytologic study of urine revealed no abnormalities. Excretory urography showed compression and medial displacement of the right renal pelvis (Fig. 1). Unenhanced CT showed a mass occupying the right renal sinus. The mass was iso-dense compared with the renal parenchyma (Fig. 2A). The mass presented with hypoenhancement and good contrast to the surrounding renal parenchyma on contrast-enhanced CT (Fig. 2B). Right renal angiography showed stretching of peripheral branches of the renal artery and no tumor vessels (Fig. 3). A whole body scan with a dual head rectangular gamma camera (GCA901A-WB, Toshiba, Japan) was obtained at 48 hours after IV injection of 111 MBq of Ga-67. The posterior planar image demonstrated well-demarcated accumulation of the tracer at the lateral portion of the tumor (Fig. 4A, B). Since the tumor showed signs of hypovascularity and was located in the central portion of the kidney, the preoperative diagnosis was renal pelvic carcinoma.

The patient underwent radical right nephrectomy. Macroscopically, a dark-yellowish tumor measuring 3 cm in diameter occupied the mid portion of the right kidney. Tumor necrosis was prominent in the medial portion of the tumor. A pathologic specimen showed the right renal tumor originating in the renal medulla. Tubulopapillary proliferation of atypical cells was noted with minimal infiltrating growth into the surrounding renal parenchyma (Fig. 5). The pathological TNM classification of the tumor was pT1N0M0 (Stage 1) and the histological grade of the tumor was G2. Immunohistochemically, the tumor cells were positive for cytokeratin 19, epithelial membrane antigen, and Tamm-Horsfall protein, and a diagnosis of Bellini duct carcinoma was confirmed

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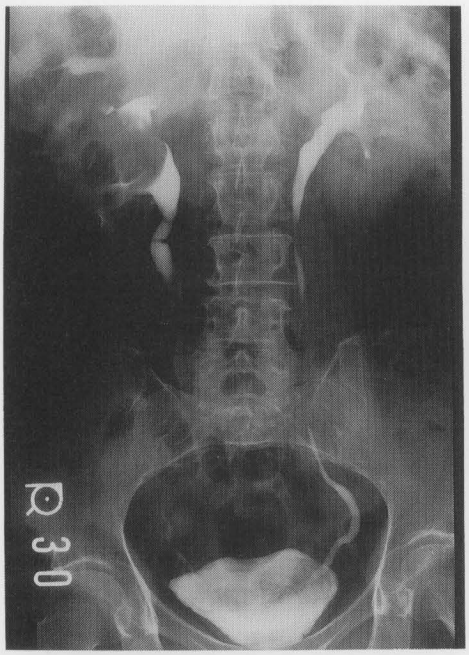


Fig. 1 Excretory urography showing compression and medial displacement of right renal pelvis.

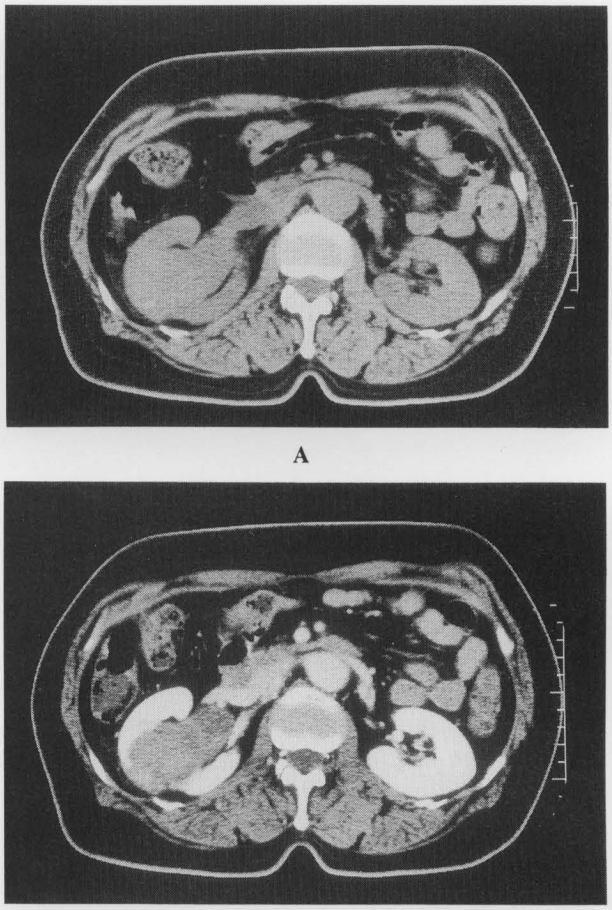
pathologically. She underwent immunochemotherapy. After a 28-month follow-up period, she is well and has no evidence of disease.

DISCUSSION

Bellini duct carcinoma of the kidney is a rare variant of renal cell carcinoma which originates in the collecting tubules.[2] The incidence of Bellini duct carcinoma is very low; Rumpelt et al. found six Bellini duct carcinomas among 1400 tumor nephrectomies (0.4%).[3] Patients with Bellini duct carcinoma generally have a poor prognosis due to its high histological grade and advanced clinical stage.[4,5] Bellini duct carcinomas show an infiltrative pattern of tumor growth and a very high incidence of intrarenal and small hilar renal vein invasion.[3] Therefore, patients with this rare tumor should be followed up carefully for a longtime, even from the early stages of the disease.[6,7]

The first three cases of Bellini duct carcinomas were reported as papillary renal cell carcinomas in 1976,[8] and Bellini duct carcinomas have been often misdiagnosed as renal or transitional cell carcinoma even on histologic examination. But recent developments in immunohistochemical staining facilitate more precise determination of the origin of a renal tumor, and this entity may be more common than previously thought.[9]

Several studies have described the radiologic findings of Bellini duct carcinomas. Excretory urography revealed no abnormality or compression of the pelviocalyceal system.[4,6,7,10–12] Ultrasonography and CT demonstrated



A

B

Fig. 2 (A) Unenhanced CT showing a mass occupying the right renal sinus. The mass shows iso-density compared with renal parenchyma. (B) Contrast-enhanced CT showing hypoenhanced mass and good contrast to surrounding renal parenchyma.

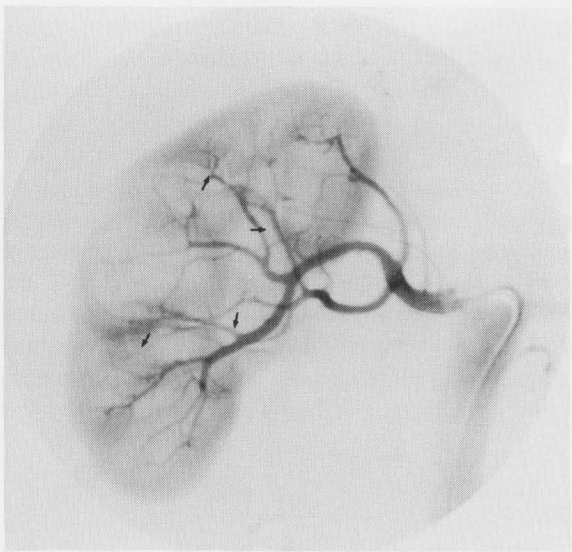
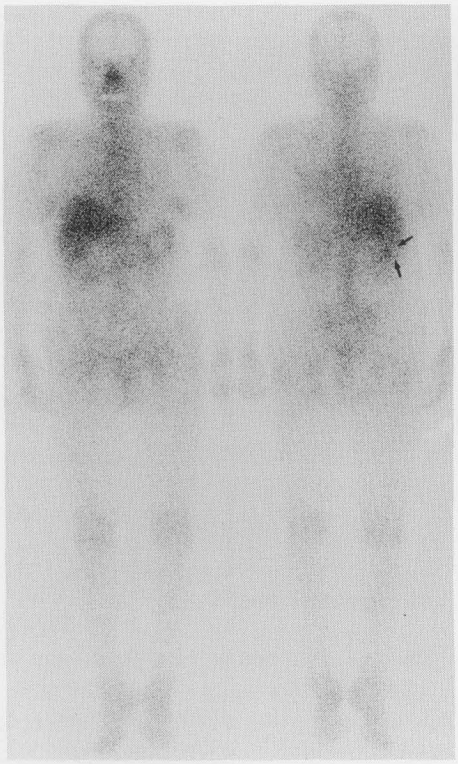
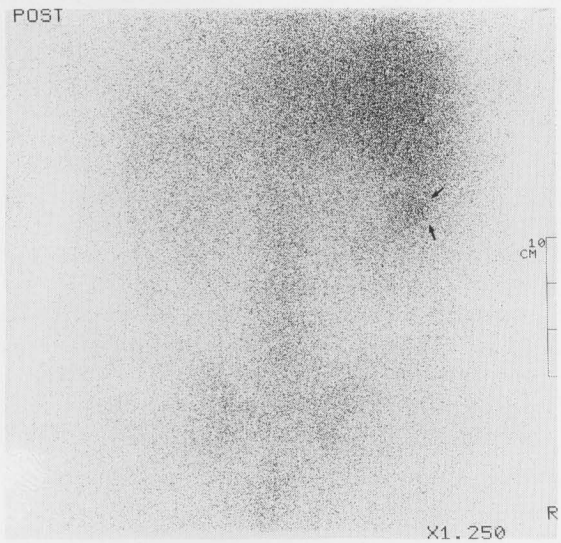


Fig. 3 Right renal angiography showing hypovascular mass (arrows) in the central portion of the right kidney and no pathological vessels.



A



B

Fig. 4 (A) Whole body scintigrams. (B) Posterior abdominal scintigram. Well-demarcated accumulation of Ga-67 is noted below the hepatic uptake (arrows). Location of the Ga-67 uptake corresponds to lateral portion of the tumor.

centrally located solid tumors.[1,4,6,7,12–14] Angiography revealed avascular and hypovascular masses, but no tumor vessels.[4,6,10–12,14] Similar radiologic findings were also obtained in our patient, and these findings resembled those of hypovascular renal tumors such as papillary renal and transitional cell carcinomas.

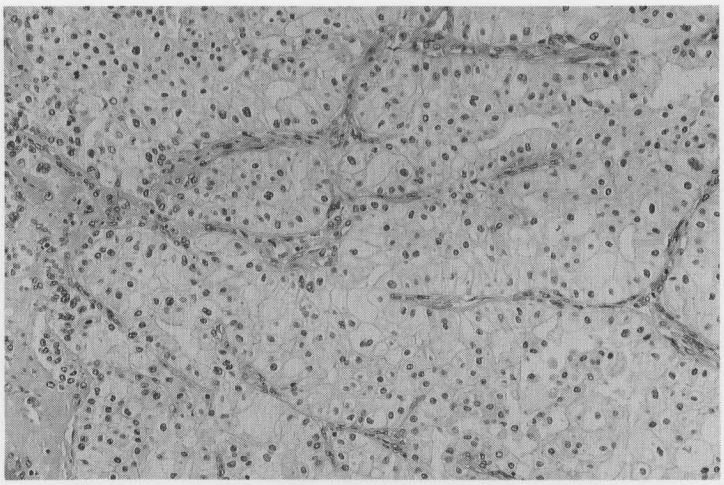


Fig. 5 Tubulopapillary proliferation of the atypical cells are noted with cuboidal, eosinophilic cytoplasm and nuclear polymorphism. (hematoxylin-eosin stain × 200)

Despite the current widespread use of Ga-67 as a tumor-seeking agent, the general consensus is that Ga-67 has limited value in the workup of renal cell carcinoma.[15] Miyamae et al. reported 6 of 23 (26%) patients and Sauerbrunn et al. reported one of 7 (14%) patients with a renal cell carcinoma who had positive Ga-67 uptake in the primary site.[16,17] In contrast, Miyamae et al. reported 6 of 7 (86%) and Sauerbrunn et al. reported 18 of 26 (69%) metastatic sites of renal cell carcinoma which showed positive Ga-67 uptake. Ga-67 scintigraphy may therefore be useful for the detection of metastatic foci of renal cell carcinoma, but it has only low sensitivity in the detection of the primary lesion.

Also in transitional cell carcinoma of the kidney, Ga-67 scintigraphy had low sensitivity when used to detect primary lesions.[17] There is only one report of a primary transitional cell carcinoma of the kidney that was positive for Ga-67 uptake.[18] Since primary renal tumors have poor uptake of Ga-67, the presence of this tracer in the kidney beyond 24 hours postinjection usually suggests infection or possibly lymphoma.[19]

Only one report has described the clinical use of Ga-67 in a case of Bellini duct carcinoma,[14] in which reported Ga-67 uptake was detected in both the primary site and metastases of Bellini duct carcinoma. In our patient, Ga-67 scintigraphy similarly demonstrated an accumulation of the tracer in the primary site of the Bellini duct carcinoma, particularly in the lateral portion of the tumor. The medial portion of the tumor had prominent necrosis on pathological examination, and this might reflect Ga-67 uptake observed in the lateral portion of the tumor. We assume that the accumulation of Ga-67 in Bellini duct carcinoma reflects the embryogenic origin and high grade malignancy of this tumor. Kawamura et al. reported that patients with high Ga-67 uptake had more advanced stages of the disease, a high grade in histology, and poor

prognosis in renal cell carcinomas.[20] Patterson noted that Ga-67 appeared to be taken up best in the most undifferentiated tumors; he also cited evidence suggesting that the rate of proliferation may be one factor responsible for the degree of Ga-67 uptake by tumors.[21] These clinicopathological features, including advanced stage of disease, high grade on histology and undifferentiated tumor are also common in Bellini duct carcinomas. We therefore postulate that Bellini duct carcinoma will be demonstrated by Ga-67 scintigraphy more often than the more usual renal or transitional cell carcinoma.

CONCLUSION

A case of Bellini duct carcinoma of the kidney was reported. The tumor showed apparent uptake of Ga-67. We believe that Ga-67 scintigraphy has potential utility in the detection of Bellini duct carcinoma of the kidney. If a hypovascular tumor occupying the central portion of the kidney shows Ga-67 uptake, Bellini duct carcinoma should be included in the differential diagnosis.

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