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Imaging Patterns of Atypical Renal Cell Carcinoma Recurrence: A Pictorial Review

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Introduction

Renal cell carcinoma accounts for 2% of all adult malignancies [1]. This cancer exhibits a highly variable constellation of presenting signs and symptoms, and, in 25%−40% of cases, is actually diagnosed as an incidental finding [1]. In patients with localized disease at presentation and who are treated surgically, distant metastases still develop in 20%−50% [1−4]. Although 85% of relapses occur within 3 years, recurrence may occur over an unpredictable time frame, up to and beyond 10 years after resection [1]. Common sites of recurrence include lung, liver, bone, and brain. However, this cancer also has a predilection for reappearing in unusual sites, presenting both clinical and radiologic diagnostic challenges if the original diagnosis is not borne in mind. If detected in a timely manner, then such isolated metastases may be curatively resected [4,5]. Survival advantage is conferred on those with a longer disease-free interval and a single site of recurrence [4,5]. This pictorial review of unusual sites of disease recurrence, both local and metastatic, diagnosed at our institution, highlights the need for an awareness of the variety of atypical manifestations of renal cell carcinoma recurrence.

Methods

We reviewed both the radiologic and urologic databases of patients who presented with recurrence of renal cell carcinoma to our institution over the past 10 years, a total of 634 patients. The majority of these patients were found to have local nephrectomy bed recurrence of tumour or disease metastatic to the typical sites, such as lung or bone. The more unusual and unexpected patterns of disease recurrence were subselected for this pictorial review. We illustrate the imaging features of an extensive array of atypical locations of renal cell carcinoma metastases and unusual manifestations of local recurrence on computed tomography (CT), magnetic resonance imaging (MRI), ultrasound, positron emission tomography−CT, and plain film.

Typical Patterns of Renal Cell Carcinoma Metastases

Up to 30% of patients have metastatic disease at the time of initial diagnosis, and the most commonly involved sites are lung (50%−60% of those with metastatic disease), liver (30%−40%), bone (30%−40%), and brain (5%) [1]. Occurrence of delayed metastatic disease is common, affecting 30%−50% [4] of patients, and the typical sites of involvement are similar. Although the single metastasis is desirable for surgical management, disease recurrence is often multifocal [2].

Contrast-enhanced multidetector CT is the imaging modality of choice in the follow-up of renal cell carcinoma. Metastases of this vascular tumour are also typically hypervascular, and the protocol for optimizing detection of recurrent disease should involve imaging of the abdomen and pelvis first in the arterial phase, followed by scanning the thorax from lung apices to below both kidneys in the portal venous phase of imaging [2,6].

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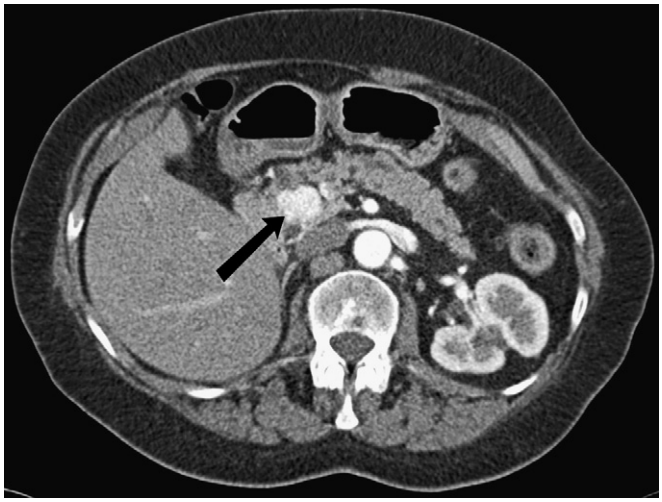

Figure 1. A 62-year-old woman with a history of right nephrectomy 5 years earlier for clear cell renal cell carcinoma. Arterial phase of contrast-enhanced computed tomography shows histologically confirmed, hypervascular metastasis in the head of the pancreas (black arrow).

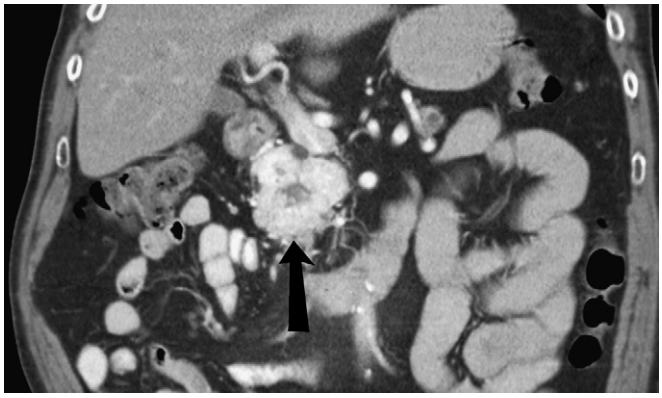

Figure 2. A 67-year-old man with a history of nephrectomy for renal cell carcinoma 13 years earlier. Arterial phase of contrast-enhanced computed tomography shows avidly enhancing mass, consistent with renal cell carcinoma metastasis in head of pancreas (black arrow) on the coronal reformatted image.

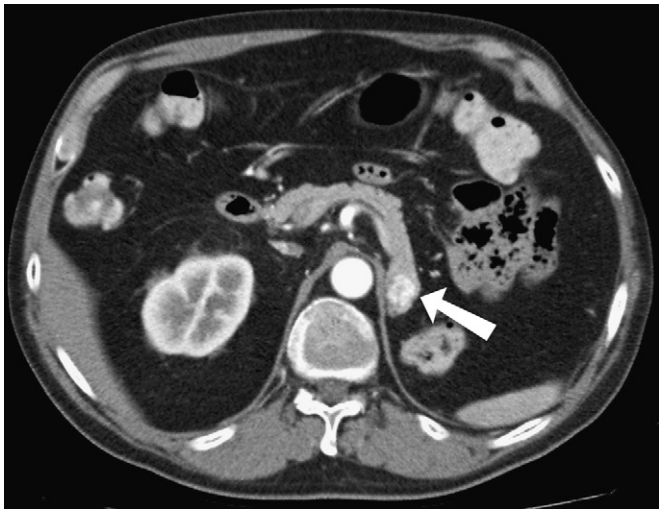

Figure 3. A 56-year-old man with a history of left nephrectomy for renal cell carcinoma 3 years earlier. Isolated metastasis to the tail of the pancreas (white arrow) identified on the arterial phase of contrast-enhanced computed tomography and confirmed by histology.

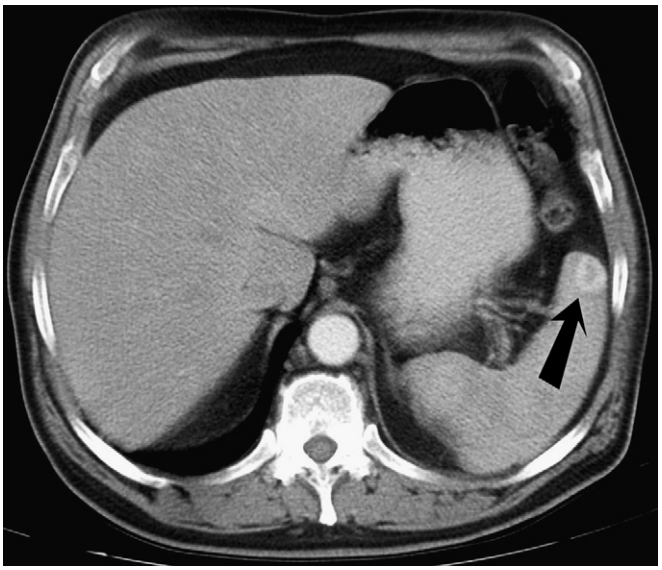

Figure 4. A 60-year-old man who underwent nephrectomy for renal cell carcinoma 8 years earlier. Arterial phase of contrast-enhanced computed tomography, demonstrating enhancing metastasis in the spleen (black arrow).

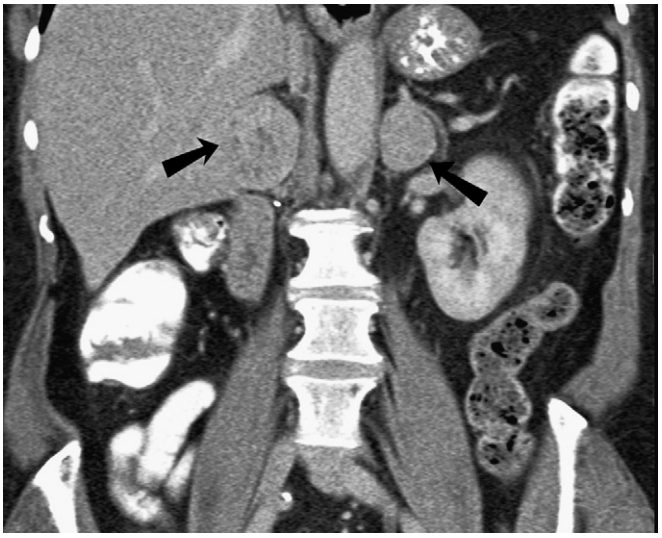

Figure 5. A 72-year-old patient with a history of right nephrectomy 5 years earlier. Bilateral adrenal masses consistent with bilateral adrenal metastases diagnosed on follow-up computed tomography (black arrows [2]), coronal reformatted image.

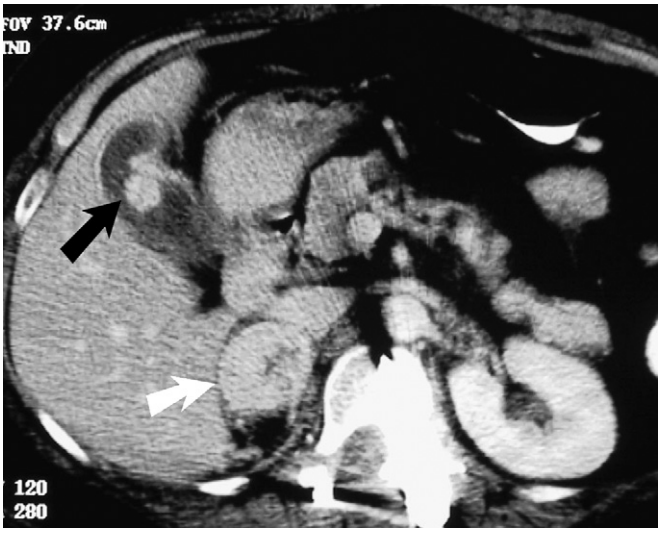

Figure 6. A 65-year-old patient with a history of right nephrectomy for renal cell carcinoma 3 years earlier. The arterial phase of the contrast-enhanced computed tomography demonstrates metastatic disease in the gallbladder (black arrow) and right adrenal gland (white arrow).

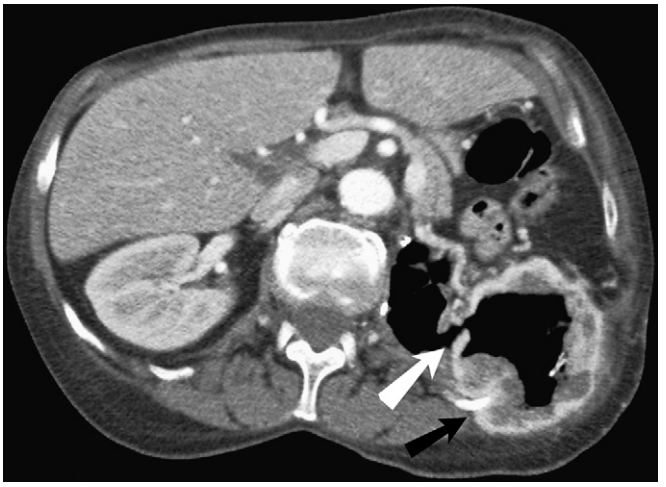

Figure 8. A 64-year-old woman with a history of nephrectomy 2 years earlier. A large, necrotic, enhancing mass (black arrow) in the region of the left nephrectomy bed, fistulating (white arrow) into the adjacent large bowel is demonstrated on contrast-enhanced computed tomography. At colonoscopy, suture material was identified at the site of the mass, through the fistula. Biopsy confirmed recurrence of the patient's original renal cancer.

Unusual Patterns of Recurrent Disease: Local and Metastatic

The route of spread of renal cell carcinoma may be hematogenous, lymphatic, direct local extension into the perirenal fat, or direct extension into the renal vein and from there to the inferior vena cava. Unusual pathways of spread possibly represent various manifestations of the hematogenous spread of this tumour. For example, bypassing the lungs via the paravertebral venous plexus of Batson is postulated to allow distant head and neck metastasis. In the case of vaginal and adnexal metastases, retrograde venous extension is considered the most likely explanation [7]. The following examples of unusual sites of disease recurrence, both local and distant, highlight the unpredictability of this tumour and its path of spread.

Pancreatic Metastases

Metastatic disease to the pancreas (Figures 1–3) from any primary tumour is quite rare, with only 2%–11% of all pancreatic malignancies being found to be nonprimary in

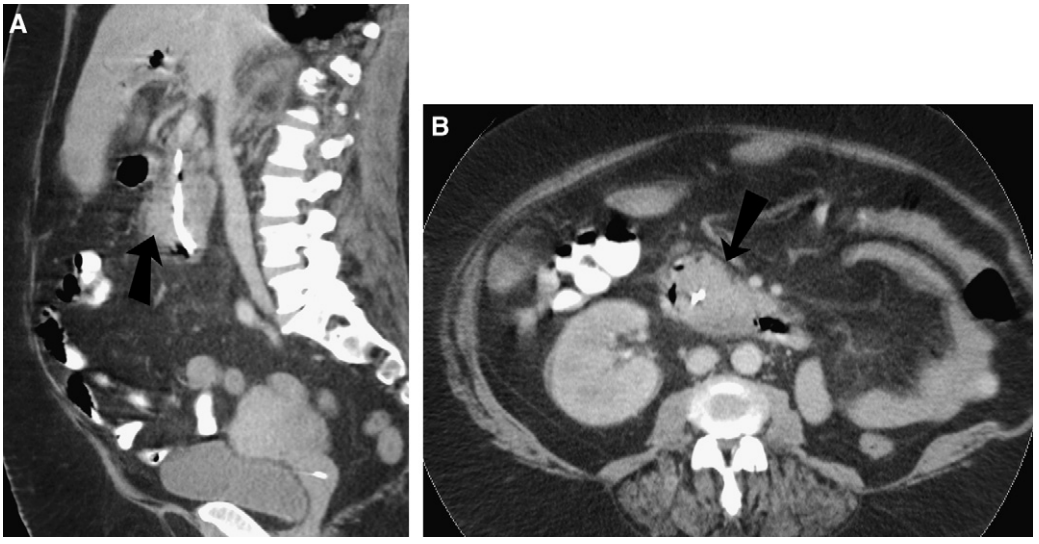

Figure 7. (A) A 50-year-old woman with a history of radical left nephrectomy for renal cell carcinoma presented with jaundice 2 years after a nephrectomy. Contrast-enhanced computed tomography (CT), showing stented common bile duct and ampullary mass (black arrow), on sagittal reformatted image. Biopsy specimens taken at endoscopic retrograde cholangiopancreatography were consistent with clear cell renal cell carcinoma recurrence. (B) Axial reformatted image of portal venous phase of contrast-enhanced CT, demonstrating the ampullary mass in this same patient (black arrow).

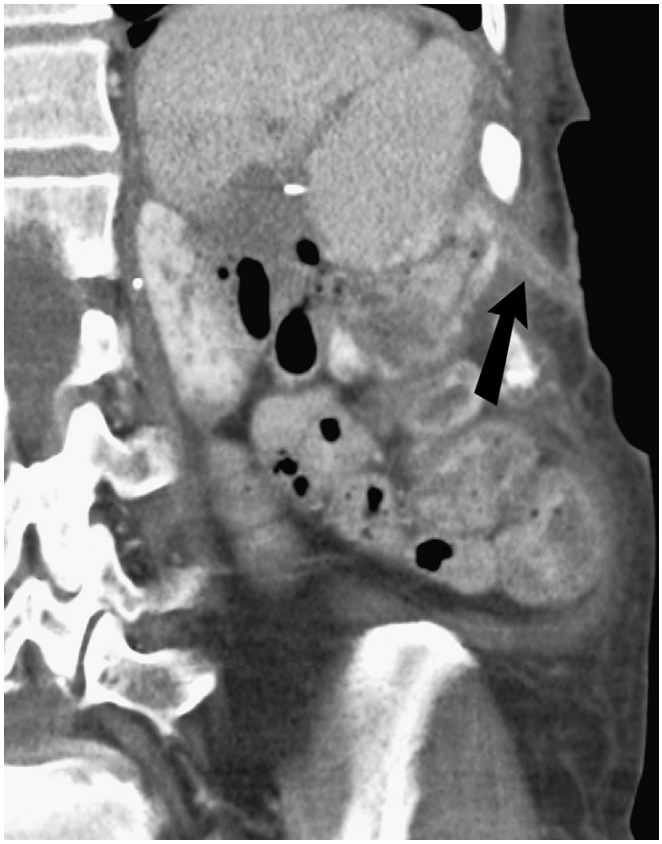

Figure 9. A 68-year-old woman with a history of nephrectomy 3 years earlier, presented with foul-smelling discharge from between the 11th and 12th ribs, the exit site of her postoperative drain. Coronal reconstruction of contrast-enhanced computed tomography shows histologically proven, recurrent disease fistulating along the clearly defined path of the previous drain (black arrow).

origin [8]. In addition, it is rare for renal cell carcinoma to metastasize to this organ; this occurs in only 1%–3% of all cases [8]. Such metastases may be uni- or multifocal and, unlike primary ductal adenocarcinoma, tend to be hypervascular. Of note, islet cell tumours also may be hypervascular. The pancreatic recurrence of renal cell carcinoma often occurs several years after the intended curative nephrectomy and so suspicion must always be high for metastatic disease in patients with a history of nephrectomy for renal cancer.

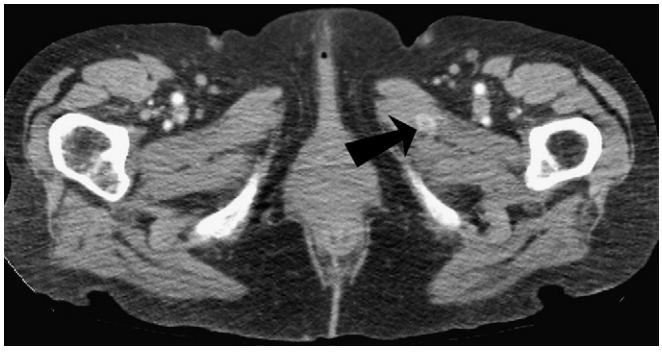

Figure 10. A 70-year-old woman with a history of renal cell carcinoma 6 years earlier. Axial reconstruction of contrast-enhanced computed tomography shows hypervascular metastatic deposit consistent with renal cell metastasis in the left-sided adductor muscle (black arrow).

Splenic Metastases

Similar to the pancreas gland, metastatic disease, of any variety, to the spleen is quite rare, and splenic deposits of recurrent renal cell carcinoma are described on a case report basis (Figure 4) [9].

Bilateral Adrenal Metastases

Adrenal metastases (Figure 5) from renal cancer are relatively uncommon and may develop in up to 10% of patients [6]. Bilateral adrenal metastases are extremely rare and, again, are described largely on a case report basis in the literature [10].

Gallbladder Metastases

Metastatic disease in the gallbladder is quite rare, but soft tissue nodularity within this organ should raise suspicion (Figure 6), particularly in a patient with a history of malignant melanoma, gastric cancer, or, indeed, renal cell carcinoma [11], which represent the more common of case reported examples.

Ampullary Metastases

Late metastasis of renal cell carcinoma to the ampulla of Vater (Figure 7), presenting clinically as obstructive

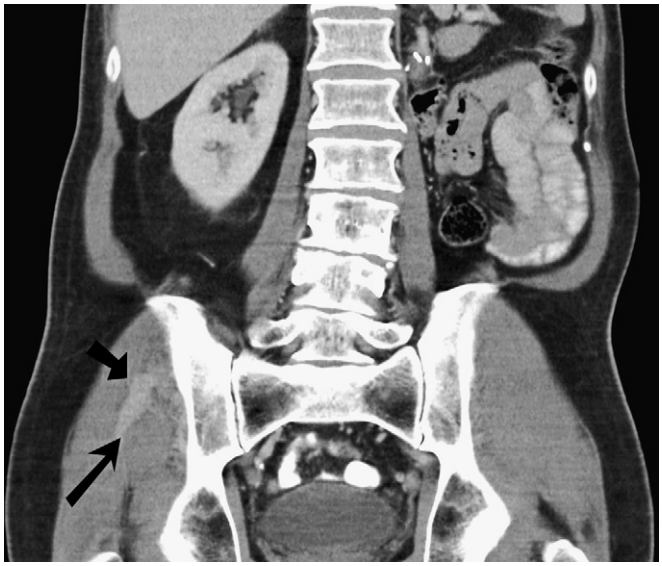

Figure 11. Coronal reconstruction of contrast-enhanced computed tomography in a patient with a history of left nephrectomy for renal cell carcinoma 5 years earlier. An enhancing soft tissue mass within the right gluteal muscles (black arrows) consistent with hypervascular metastases from his known renal cancer.

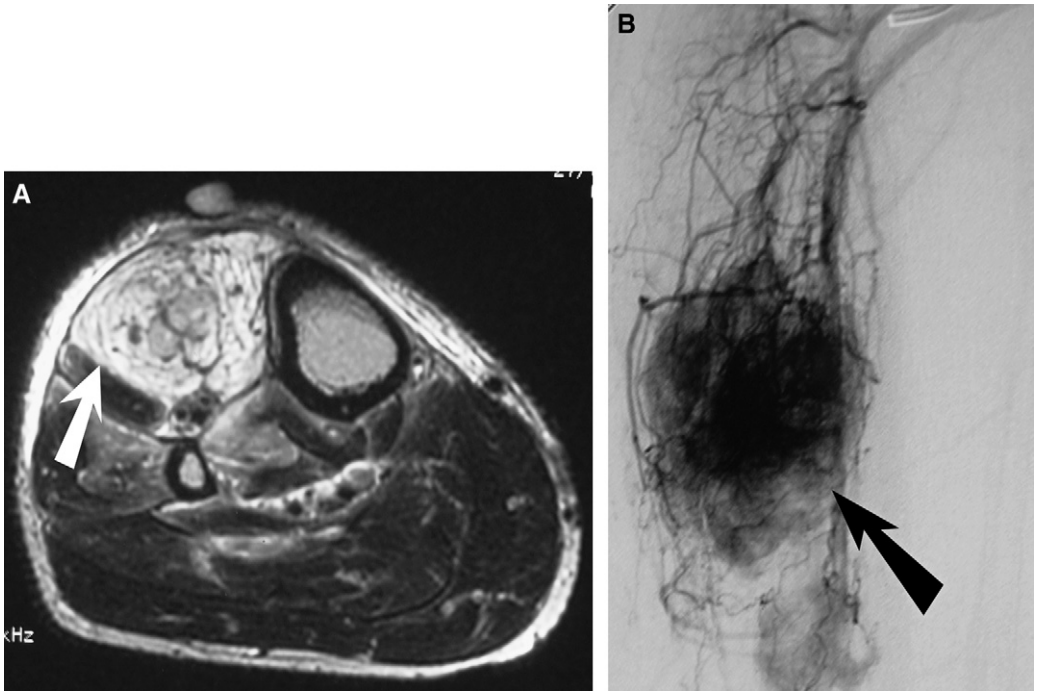

Figure 12. (A) A 50-year-old man with history of nephrectomy for renal cell carcinoma 2 years earlier, presented with a mass over the anterior aspect of the lower limb. T2-weighted magnetic resonance imaging, axial reconstruction, showing high signal mass within the tibialis anterior muscle (white arrow). Biopsy confirmed recurrence of this patient's original renal tumour. (B) Spot image from lower limb angiography in the same patient, demonstrating the hypervascularity of this tibialis anterior based renal cell carcinoma metastasis (black arrow).

jaundice, malabsorption, or as a bleeding mass, has been described on a case report basis in the literature. The majority of reported cases have occurred after an extended disease-free interval [12]. In general, the ampulla of Vater is an unusual site for metastatic disease of any type.

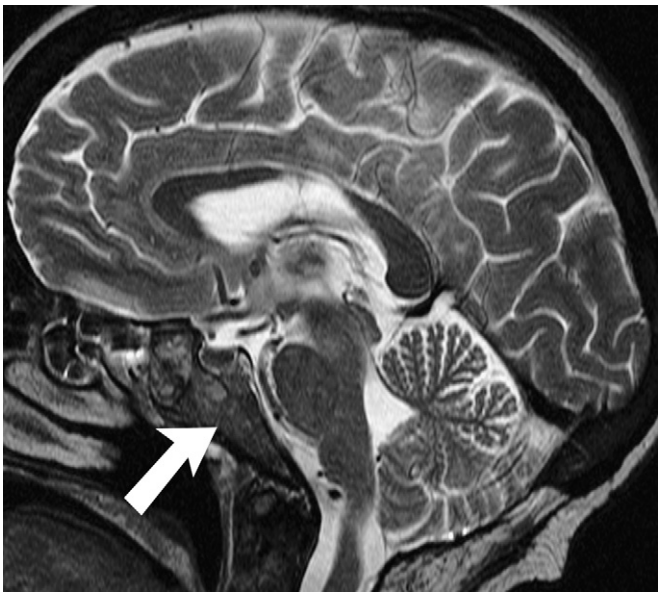

Figure 13. A 45-year-old woman with a background of von Hippel-Lindau syndrome, who underwent nephrectomy for renal cell carcinoma 2 years earlier. Sagittal T2-weighted magnetic resonance image of the brain, showing infiltration of the clivus and posterior ethmoid air cells with tumour mass (white arrow), consistent with renal cell metastasis.

Large Bowel Recurrence

Nephrectomy bed recurrence may involve adjacent large or small bowel and may present clinically with rectal bleeding, intussusception, or fistulation (Figure 8).

Recurrence Along the Postoperative Drain Site

Recurrence of renal cell carcinoma along a previous postoperative drain tract is quite an unusual finding (Figure 9). A search of the literature confirms case reported examples of other tumours, such as pancreatic [13], squamous cell cervical and colorectal cancer, seeding and recurring along the tract of a previous postoperative drain. Along a similar theme, port-site subcutaneous metastases have also been described for a variety of tumours, including esophageal, gallbladder, and, indeed, renal cell carcinoma.

Unusual Sites of Skeletal Muscle Metastases

Skeletal muscle metastases as distinct entities from renal bed recurrence are quite rare and often asymptomatic (Figures 10–12) [2]. Isolated metastases to skeletal muscle have been described in numerous case reports. Erector spinae is one of the more common sites [2], but careful attention must be paid to all of the skeletal muscles, particularly on the arterial phase of scanning. As with metastases in other locations, unifocal disease with a longer recurrence-free

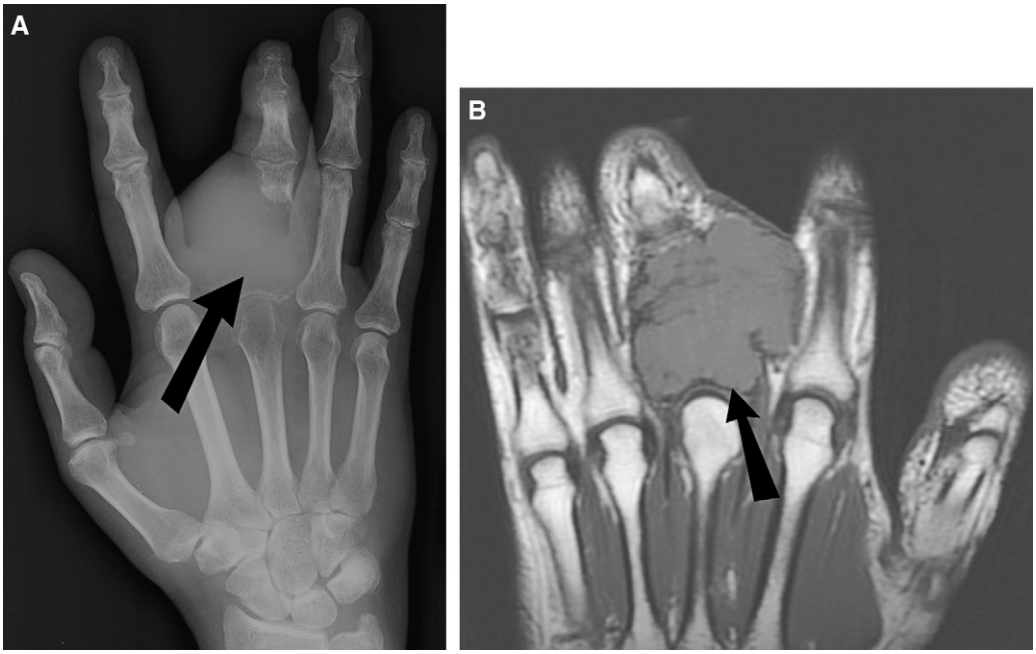

Figure 14. (A) Expansile, lytic bony metastasis (black arrow) demonstrated on plain film, at the proximal phalanx of the third digit in this patient with a history of nephrectomy for renal cell carcinoma 3 years earlier. Amputation specimen confirmed the recurrence of this patient's renal cell carcinoma. (B) T1-weighted magnetic resonance image of the hand of this same patient, showing a low signal soft tissue mass at the site of bony destruction (black arrow).

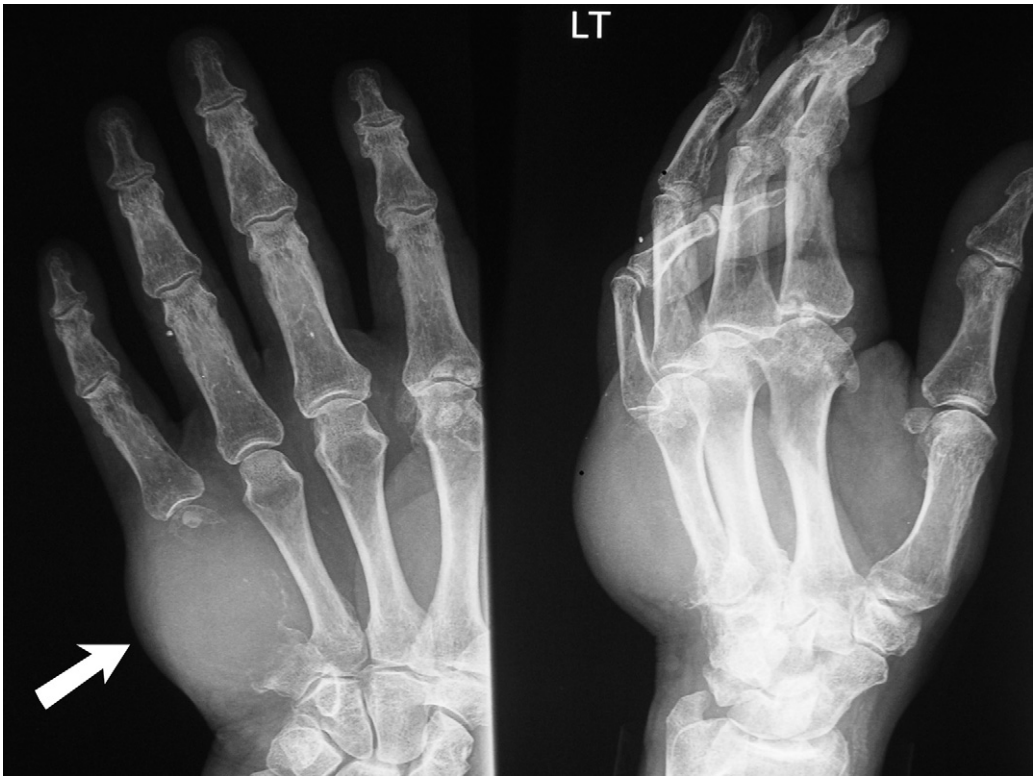

Figure 15. Expansile, lytic bony metastasis (white arrow) of the fifth metacarpal demonstrated on plain film in this patient with a history of nephrectomy for renal cell carcinoma 2 years earlier.

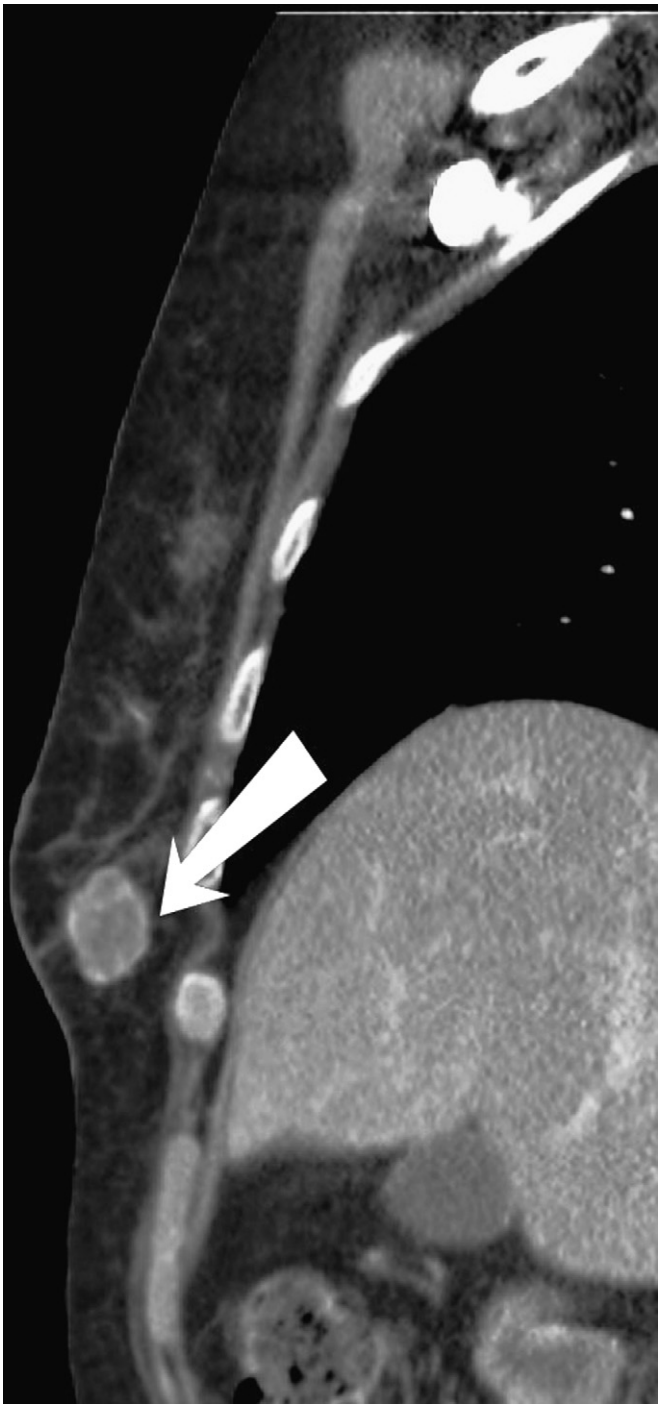

Figure 16. A 70-year-old woman with a known history of renal cell carcinoma, surgically resected 4 years earlier. Sagittal reconstruction of contrast-enhanced computed tomography reveals hypervascular breast deposit (white arrow), clinically palpable as a mass.

interval affords the best prognosis, enabling potentially curative treatment.

Unusual Bony Metastases

Expansile, lytic bony metastases are common with renal cell carcinoma and typically involve the axial skeleton, especially from T12 to the pelvis (Figures 13–15) [2]. Rib involvement is not uncommon. More unusual bony locations should also be suspected in the patient with a history of renal cell carcinoma, prompting more focused attention to the bony windows on routine follow-up imaging. Examples diagnosed in our institution include bony metastases to the clivus, an isolated phalangeal metastasis, and an expansile lytic metacarpal metastasis. A single other case report of renal cell carcinoma metastasizing to the clivus was found in the literature [14].

Breast Recurrence

Metastases within the breast from any nonmammary primary and which may clinically be confused with a primary breast carcinoma, have been described very rarely in the literature (Figure 16) [15]. However, in patients with a history of nephrectomy for renal cell carcinoma, the finding of a new breast lump should at least raise the suspicion of metastatic disease.

Parotid Metastasis

Metastatic disease to the parotid (Figure 17) is again quite rare, particularly from neoplastic processes below the clavicle. Renal cell carcinoma metastases to the parotid are described on a case report basis.

Pituitary Recurrence

Brain metastases from renal cell carcinoma typically appear as multiple enhancing nodules. Isolated metastases to the pituitary gland are very uncommon (Figure 18).

Testicular Recurrence

Metastatic disease to the testes and adnexal structures is also quite rare, and metastases from a renal cell primary is still largely described on a case report basis (Figure 19) [16]. Reports of both ipsilateral and contralateral testicular recurrence highlights again the unpredictability of renal cell carcinoma in its mode of spread.

Conclusion

Renal cell carcinoma is an unpredictable tumour in both its initial manifold clinical presentations and in its mode of spread. Strong clinical suspicion of metastases is required in the setting of new symptoms and clinical findings in a patient with a background of nephrectomy for renal cell carcinoma, however historic. The principle imaging tool to be used in follow up of these patients is contrast-enhanced CT, ensuring both arterial and venous phases are reviewed to optimize detection of hypervascular metastases.

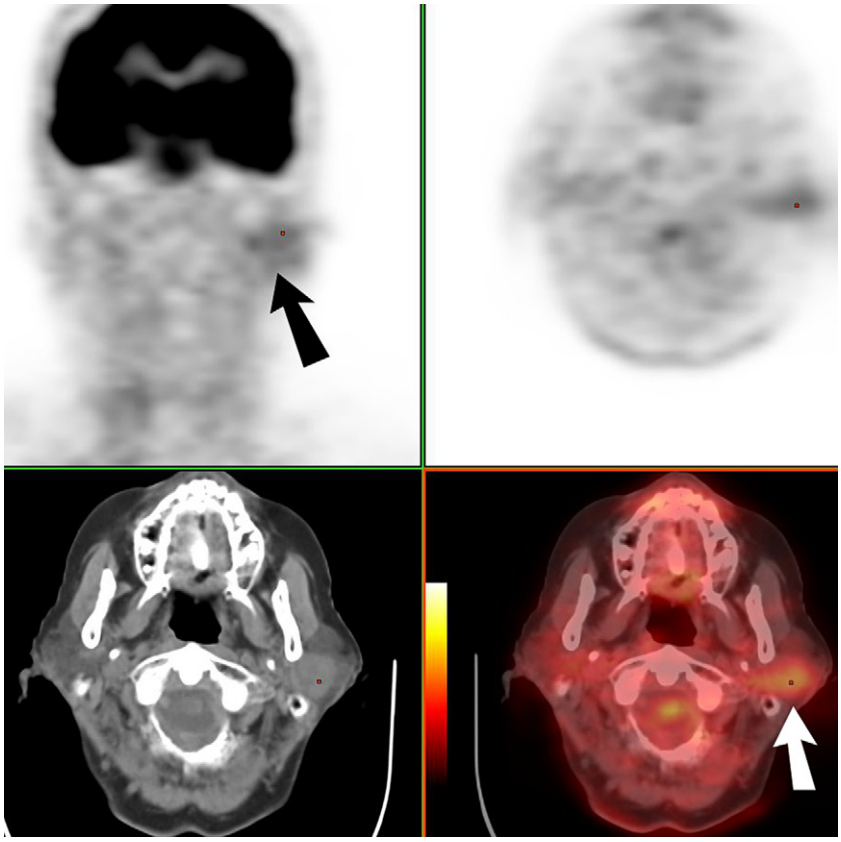

Figure 17. A 50-year-old patient with a known history of nephrectomy for renal cell carcinoma 4 years earlier. Computed tomography shows the soft tissue mass (white arrow) in the parotid gland, which corresponds with the focus of increased radioisotope uptake on positron emission tomography (black arrow), consistent with the presence of tumour. Parotid biopsy was undertaken, and recurrence of the patient's clear cell renal cancer was confirmed on histology. This figure is available in colour online at http://carjonline.org/.

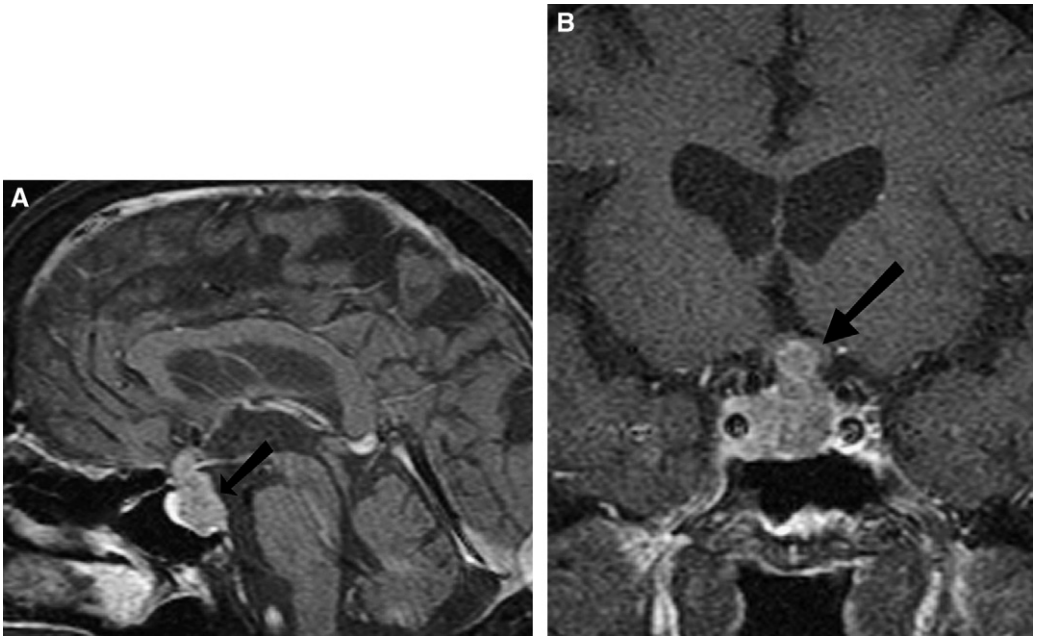

Figure 18. (A) Sagittal reconstruction of post-contrast T1-weighted magnetic resonance image (MRI) of the brain, showing a large, enhancing mass within the pituitary fossa (black arrow) in this patient with a history of renal cell carcinoma 5 years earlier. The finding is consistent with hypervascular metastasis. (B) Coronal reconstruction, postcontrast, T1-weighted MRI of the same patient, demonstrating enhancing pituitary mass (black arrow), consistent with renal cell carcinoma recurrence.

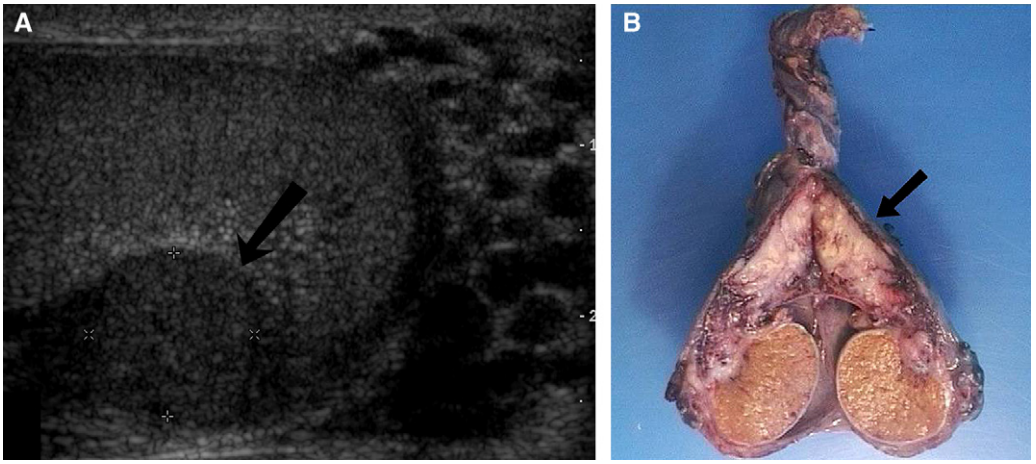

Figure 19. (A) A 74-year-old man who had undergone left nephrectomy 1 year earlier for renal cell carcinoma developed a painless left scrotal lump, shown here on ultrasound (black arrow). (B) Gross resection specimen of left scrotal contents of this same patient. Histology confirmed the presence of metastatic renal cell carcinoma in the spermatic cord (black arrow) and rete testis. This figure is available in colour online at http://carjonline.org/.

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