Renal Cell Carcinoma Presenting with Skull Metastasis: A Case Report and Literature Review

Hsin-Chih Yeh,[1] Sheau-Fang Yang,[2] Hung-Lung Ke,[1] Kung-Shing Lee,[3] Chun-Hsiung Huang,[1,4] and Wen-Jeng Wu[1,4]
Departments of [1]Urology, [2]Pathology and [3]Neurosurgery, Kaohsiung Medical University Hospital, and [4]Department of Urology, Faculty of Medicine, College of Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan.

The occurrence of metastasis to the head and neck region in renal cell carcinoma is extremely rare. An 80-year-old man presented with a soft nodule in the left parietal calvarium and was admitted to our hospital. Biopsy of the nodule showed nests of clear tumor cells, suggesting metastatic renal cell carcinoma. Computed tomography of the abdomen revealed a well-defined hypervascular tumor, measuring around 7×7×8 cm, exophytic from the lower pole of the right kidney. Since there were no other systemic metastases, right nephrectomy and complete resection of the skull lesion were performed. No adjunctive therapy was given postoperatively. After 22 months of follow-up, the patient was well and without evidence of disease.

Key Words: renal cell carcinoma, skull metastasis
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Renal cell carcinomas (RCCs) comprise 2–3% of all adult malignancies and 85% of malignant renal tumors. The highest incidence is in individuals in the sixth and seventh decades of life, with a median age at diagnosis of 66 years [1]. Characteristically, the tumor is slow-growing and encapsulated in its early stages and thus asymptomatic [2]. In some cases, metastasis precedes the clinical manifestations of the primary tumor [3]. In a review of 128 articles, Wahner-Roedler and Sebo found that metastasis was described in about 50 different sites [4]. Among these, the calvarium was an extremely unusual site of metastasis, which was only mentioned in a few case reports [5–7].

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Address correspondence and reprint requests to: Dr Wen-Jeng Wu, Department of Urology, Kaohsiung Medical University Hospital, 100 Shih-Chuan 1st Road, Kaohsiung 807, Taiwan.
E-mail: urology@kmu.edu.tw

Case Presentation

An 80-year-old man was admitted to the neurosurgery department for evaluation of a mass on the left parietal scalp area, which was accidentally noted by the patient 1 week prior to consult. The mass was soft and painless, measuring approximately 5×4 cm. The patient denied any head trauma history and no neurologic symptoms were found. Specifically, there was no hematuria, flank pain, or weight loss.

Physical examination revealed a skull defect in the left parietal bone. The overlying mass was non-tender and pulsatile on palpation. The patient's visual fields were full, and results of the neurologic examination were unremarkable.

Skull radiograph showed a well-defined radiolucent lesion at the left parietal bone, simulating a prominent venous lake. However, computed tomography (CT) scan revealed a soft tissue lesion in the left parietal bone with marked bone destruction, intracranial

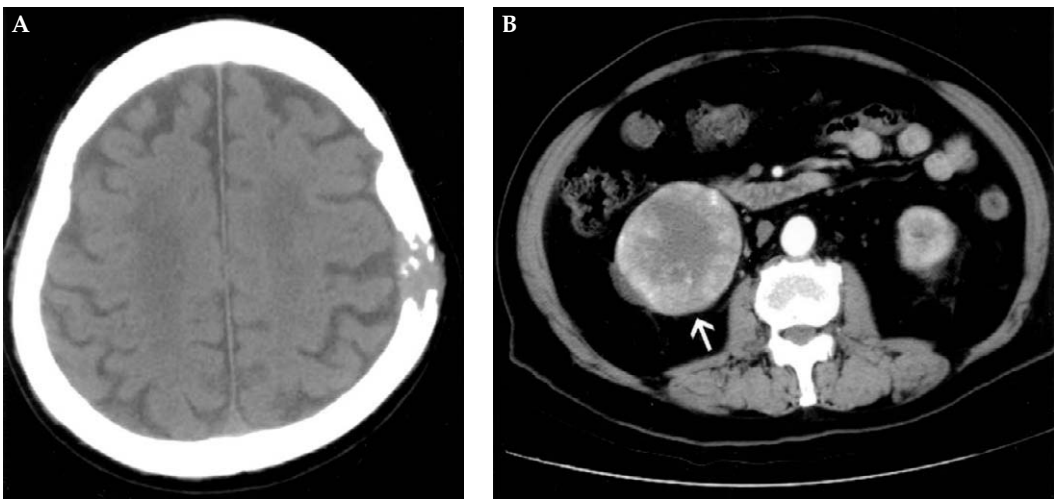

Figure 1. *(A) Axial computed tomography (CT) scan of the head shows a mass lesion at the left parietal area of the skull with bone destruction. (B) Axial CT scan of the abdomen reveals a well-enhanced tumor (arrow) with central necrosis in the right kidney.*

extension with compression of the dura, and invasion of the soft tissues of the scalp, suggesting a malignant tumor or a metastatic lesion (Figure 1A). Results of chest X-ray, complete blood count, serum electrolyte levels, and urinalysis were within normal limits.

Needle biopsy was performed and permanent section of the obtained specimen showed large cells with abundant cytoplasm, marked nuclear atypia, and prominent nucleoli. Using light microscopy, the pathologist interpreted the specimen as metastatic RCC composed of nests of clear tumor cells with delicate vascular plexus and hemorrhage.

Abdominal CT showed a well-defined $7 \times 7 \times 8$ cm hypervascular tumor exophytic from the lower pole of the right kidney, suggestive of RCC (Figure 1B). No para-aortic/pelvic lymphadenopathies or other bony lytic lesions were identified. Total body bone scintigraphy revealed increased radionuclide activity (hot region) at the left fronto-parieto-temporal skull, consistent with metastatic bone disease.

The diagnosis of metastatic RCC was established and the patient was transferred to the urology ward and underwent right radical nephrectomy. Although much perirenal adipose tissue and neovascularization were encountered, the operation was performed smoothly. Total resection of the metastatic skull lesion and cranioplasty were also done. The tumor had invaded the skin and was necrotic in its deeper parts. Complete erosion of the underlying skull bone was found and parts of the tumor extended into the dura.

Gross pathologic examination showed an elastic, mottled grayish-yellow mass that measured $7.5 \times 7.3 \times 7.0$ cm in size, the cut surface of which revealed foci of necrosis and hemorrhage. Microscopic evaluation of sections stained with hematoxylin-eosin revealed a well-demarcated tumor composed of polygonal tumor cells with clear cytoplasm and hyperchromatic nuclei, findings typical of conventional (clear cell) RCC (Figure 2A). The histologic grade was Fuhrman grade 3 and the pathology stage was pT2N0M1. The tumor was confined to the renal parenchyma with tendency to penetrate the renal capsule. Both the skull bone and the dura showed infiltrating metastatic RCC (Figure 2B). The patient was discharged 10 days after surgery, revealing no evidence of local recurrence or distant metastasis during the 22-month follow-up.

Discussion

RCC is a tumor with an unpredictable clinical course and behavior. Metastases have been reported to develop 17 years or more after the primary lesion is removed [8]. The most frequent metastatic locations are the lungs, bone, liver, and adrenal glands. RCC is the third most likely infraclavicular tumor to metastasize to the head and neck area, preceded only by breast and lung carcinomas [9]. Around 14–16% of patients with RCC have metastases in this area, 8% of which presents as the first clinical manifestation of the disease

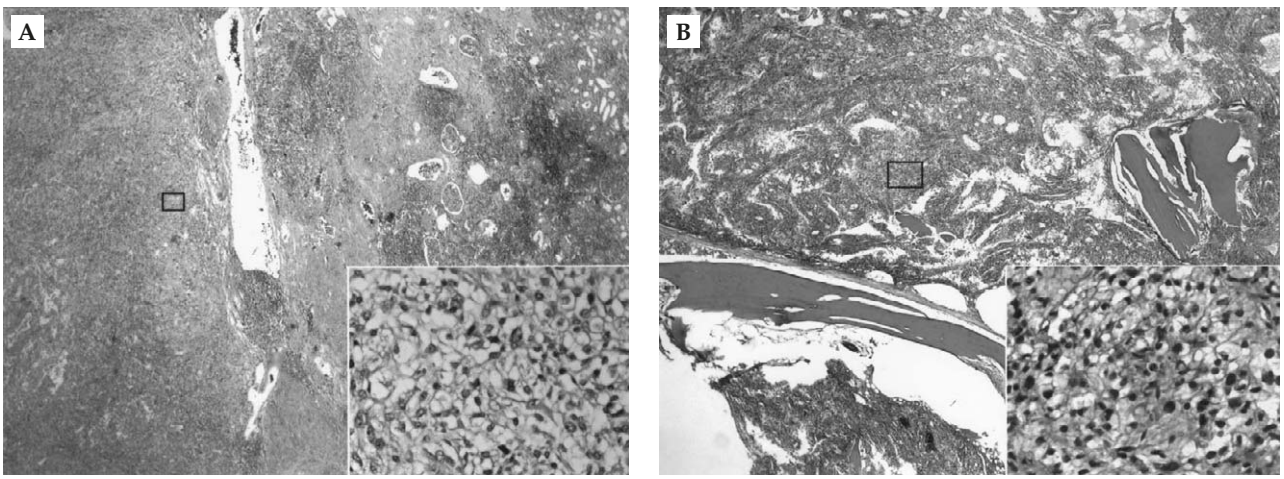

Figure 2. *Histology pictures. (A) The kidney shows a well-demarcated tumor composed of polygonal tumor cells with clear cytoplasm and hyperchromatic nuclei (insert). (B) There are infiltrative tumor nests in the marrow spaces of the skull. The photograph shows tumor cells similar to renal cell carcinoma of the kidney (insert). (Hematoxylin and eosin; magnification, 40×; insert photograph magnification, 400×.)*

[10]. Namely, only 1% of RCC patients have no other obvious metastasis except the head and neck [11].

RCC frequently invades the local vascular network by direct extension. It has been postulated that metastatic RCC cells can reach the head and neck area by normal hematogenous flow through the lungs, leaving microscopic seeding in the lung parenchyma, which may not be visible on chest radiograph [12]. However, the most important route of metastasis seems to be tumoral embolization via the Batson plexus, namely the anastomosis between the avalvular vertebral and epidural venous system [13]. This can explain the lack of lung metastases in patients with positive head and neck lesions.

The patient described here presented with scalp swelling and intact overlying skin. In light of the operative findings, the skin and dura involvement appeared to be invasion from a cranial deposit. We suppose that the route of spread to the scalp in this case was hematogenous to the parietal bone and from there, by direct invasion to the scalp and dura.

The standard of care for localized and metastatic RCC includes radical nephrectomy. Historically, the role of surgery in metastatic RCC is for diagnosis and debulking of disease. At present, metastatic deposits have been known to disappear following resection of the primary lesion [14]. Complete spontaneous regression of pulmonary and bone metastases after removal of the primary tumor has been described, which occurred due to immunologic reactions [15]. Although the actual incidence is low, patients with bizarre spread of RCC to the head and neck region may have relative resistance to pulmonary metastases [12]. Long-term survival of this patient here may provide evidence for this hypothesis.

Patients who have an asymptomatic RCC but have signs and symptoms referable to a site of metastasis (as in our patient) have a diagnostically challenging subset of stage IV disease [4]. Imaging procedures do not reveal specific features. Radiologic diagnosis is based on the vascular nature of the tumor, which is moderate to marked signal enhancement on contrast CT. If enhancement with contrast, destruction, and lack of tumor calcification are noted on CT of the head and neck, metastatic RCC should be part of the differential diagnoses [16].

Most patients initially present with metastatic RCC that is suggestive of a widely disseminated disease and have a median survival of 1 year [17]. Moreover, synchronous detection of solitary metastasis with primary tumor is considered an unfavorable feature [18]. Nevertheless, aggressive surgical treatment can still produce the best palliative results in this particular subset of patients, and even long-term survival in some cases [19]. A study of 59 RCC patients in whom surgical resection of solitary metastases was performed resulted in 3- and 5-year survival rates of 45% and 34%, respectively [20].

Renal tumors are frequently accompanied by bone metastases. However, few cases have been described

of metastases occurring in the skull. Forbes et al reviewed 1,668 patients with RCC and only five patients presented with skull metastasis [21]. The case reported here confirms that the paradoxical sites of metastasis from RCC should be considered by clinicians. RCC should be part of the differential diagnoses of growing lesions in the head and neck. Furthermore, local resection without sacrifice of vital structures is the treatment of choice depending on the site of presentation. This may provide a chance to cure the head and neck metastasis and avoid associated morbidity that may occur if the lesion is left untreated. This patient had a slow-growing tumor and remained well despite the stage of the disease and the spread to the cranium.

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腎細胞癌以顱骨轉移表現 — 病例報告及文獻回顧

葉信志[1] 楊曉芳[2] 柯宏龍[1] 李昆興[3]
黃俊雄[1,4] 吳文正[1,4]
高雄醫學大學附設醫院 [1]泌尿科 [2]病理科 [3]腦神經外科
[4]高雄醫學大學 醫學院醫學系 泌尿學科

腎細胞癌發生頭頸部的轉移十分罕見。一位八十歲男性以左側頭頂骨有一軟性結節為表現而入院檢查。切片的結果顯示群集的明亮腫瘤細胞，讓人聯想到轉移來的腎細胞癌。腹部電腦斷層發現在右側腎臟的下端往外長出一界限清楚、血管豐富的腫瘤，大小約七乘七乘八公分。因為沒有其他系統性的轉移，右側腎臟及顱骨的病灶皆予以手術切除。術後並未給予其他輔助治療。持續追蹤二十二個月後，病人身體狀況良好且沒有疾病復發。

關鍵詞：腎細胞癌，顱骨轉移
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通訊作者：吳文正醫師
高雄醫學大學附設醫院泌尿科
高雄市**807**三民區十全一路**100**號