Bony metastasis in renal cell carcinoma

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It has been estimated that between 20% and 45% of patients with renal cell carcinoma have no symptoms directly referable to the primary lesion. Several authors have reviewed the rather unusual and deceptive clinical features which help to categorize this disease as one of the great masqueraders.[1-3] The tendency of renal cell carcinoma to metastasize to bone was first recognized early in the 20th century by Scudder.[4] Since that time osseous metastases have been documented in several reports.[5-8] However, there has never been a large series of cases of renal cell carcinoma reported on the percentage of patients with bony metastases as the chief complaint.

Material

A total of 331 cases of pathologically proven renal cell carcinoma were studied at the Cleveland Clinic over a 15-year period. Fourteen patients had bony metastases, and of these the absence of the classic triad of symptoms was impressive; only 2 of the 14 patients had palpable masses at the time of physical examination. No patient had flank pain or hematuria. *Table 1* lists the clinical features.

Thirteen of the 14 patients had urograms which were diagnostic in 10 instances with either a mass lesion or displacement of the calyceal system identified. Angiograms of four patients were positive.

Table 1. Clinical features of renal cell carcinoma

Primary bone manifestations	14 (4.2%)
Sex	10 men 2 women
Age	29–76 years (median 57 years)
Total cases	331

Tables 2 and 3 list the roentgenographic features of the metastatic lesions and the distribution of such lesions.

Twelve patients underwent surgery; nephrectomy was performed in 11. Of these 11 patients, 1 was lost in follow-up but survived at least 3 years. Of the remaining 10, 9 died; the average survival time was 5.7 months. The last patient was alive and doing reasonably well 18 months after surgery. Of the patients who did not have nephrectomy, the average survival time was 20 months.

Discussion

This study dramatizes the necessity of considering renal cell carcinoma even when there is no flank mass, flank pain, or hematuria. Sherman and Pearson[8] reported results of the most comprehensive study on roentgenographic manifestations of metastatic renal cell carcinoma; they described 36 cases of bony metastases and stated that in 28, the presenting symptom was skeletal lesions. This is approximately an 80% incidence.

This figure has not been challenged in the recent literature; however, our studies are not in agreement with this high percentage. The possible explanations include (1) more public awareness of health, (2) improvement in technique and interpretation of the urogram, and (3) broader screening programs which include chest roentgenograms and urinalysis. Since the Cleveland Clinic is a referral and not a primary care center, this may also influence our figures.

Sherman and Pearson[8] listed three forms of bony involvement: (1) lytic, (2) patchy, and (3) septate. Lytic was by far the most common and this agreed with our experience of only one patient demonstrating a septate pattern. The characteristic osseous features in our group included its location in the skull or axial skeleton or both, along with the lytic pattern which was occasionally associated with a soft tissue mass.

When there is a solitary lytic lesion, differential considerations besides metastatic disease from other primary tu-

Table 2. Roentgenographic features of lesions

1. Single or multiple.
2. Almost always lytic; occasionally septate, i.e., soap bubble; rarely blastic.
3. Tend to affect axial skeleton.
4. Rarely stimulates periosteal reaction or reactive bone formation.
5. Occasional associated soft tissue mass.
6. Frequently associated with pathologic fracture.
7. Intraosseous location not helpful.

Table 3. Distribution of osseous lesions

1. Skull		3
2. Vertebrae		6
Dorsal	3	
Lumbar	2	
Sacrum	1	
3. Ribs		1
4. Femur		1
5. Pelvis		3

mors are histiocytosis X, aneurysmal bone cysts, primary bone tumor, primarily multiple myeloma, and also infection.

Histiocytosis X usually appears in younger persons, and when it affects the vertebrae it tends to cause a symmetrical collapse resulting in vertebral plana rather than the irregular ragged destruction on one side of the vertebral body.

Aneurysmal bone cysts, although relatively rare, tend to affect the appendages of the vertebrae rather than the body and are usually eccentric and cause expansion and destruction. Infection which is also included in the differential diagnosis involves the adjoining disc space if it involves the vertebral column showing irregularity and destruction of the disc at that site.

When there is an associated soft tissue mass, myeloma is another consideration; however, typically with myeloma the pedicle is usually preserved. In metastatic disease the pedicles tend to be destroyed.

Weigensberg[3] has elaborated the pathways of metastases from the kidney and he lists six routes: (1) via the inferior vena cava; (2) via the thoracic duct; (3) via the heart, avoiding pulmonary trapping; (4) via Batson's paravertebral plexus to the axial skeleton, head, and neck; (5) via retrograde spread down the ovarian and spermatic veins to the genitalia and lower urinary tract; (6) via collaterals, or direct invasion of the overlying mesentery to the portal vein. With this information one can predict the high incidence of metastatic vertebral involvement which was present in our series.

It is of interest that the survival time of patients who did not have nephrectomy was about 3.5 times longer than those who underwent surgery. This experience does not support the hypothesis that renal cell metastases disappear following removal of the primary neoplasm.

Summary

A total of 331 cases of renal cell carcinoma were reviewed. Approximately 4% of these patients had metastatic skeletal lesions. This group represents approximately 10% to 15% of those patients with initial symptoms which were not urologic. The axial skeletal involvement and the roentgenographic characteristics help to identify the lesion. The differential diagnosis, follow-up, and survival are discussed.

References

1. Creevy CD: Confusing clinical manifestations of malignant renal neoplasms. Arch Intern Med **55:** 895–916, 1935.
2. Silverberg SG, Evans RH, Koehler AL: Clinical and pathologic features of initial metastatic presentations of renal cell carcinoma. Cancer **23:** 1126–1132, 1969.
3. Weigensberg IJ: Metastatic renal carcinoma; unusual and deceptive presenting features. South Med J **65:** 611–616, 1972.
4. Scudder CL: The bone metastases of hypernephroma. Ann Surg **44:** 851–865, 1906.
5. Copeland MM: Metastases to bone from primary tumors in other sites. Proc Natl Cancer Conf **6:** 743–756, 1970.
6. Freid JR: Skeletal and pulmonary metastases from cancer of the kidney, prostate and bladder. Am J Roentgenol **55:** 153–164, 1946.
7. McClanahan CW, Bonann LJ: Signal skeletal metastases from renal carcinoma. Am J Roentgenol Radium Ther Nucl Med **70:** 387–400, 1953.
8. Sherman RS, Pearson TA: The roentgenographic appearance of renal cancer metastasis in bone. Cancer **1:** 276–285, 1948.