Interfascicular Renal Cell Carcinoma Metastasis to the Ulnar Nerve: A Case Report

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Abstract

Background: Metastatic solid tumors to the hand and peripheral nerves are exceedingly rare independent occurrences. Their occurrence together has never been reported in the literature. **Methods:** We present a case report of a 69 year old male with a previous history of renal cell carcinoma (RCC) presenting with a rapidly-growing painful mass located at the right volar ulnar wrist, found to have endoneural solid tumor metastatic RCC to the ulnar nerve. **Results:** Preoperative MRI imaging of the wrist revealed a heterogeneous mass on the volar aspect of the wrist extending along the length of the ulnar artery and nerve to the level of Guyon's canal. Pathologic examination of an incisional biopsy of the mass was consistent with metastatic renal clear cell carcinoma cells, which were infiltrating nerve and surrounding soft tissue. The patient underwent local radiation therapy to the wrist and hand with interval decrease in size of the mass and symptom improvement. **Conclusion:** Solid tumor metastasis, although exceedingly rare, must be considered in the differential diagnosis of a patient with previous cancer history presenting with a wrist or hand mass associated with peripheral neuropathy.

Keywords: renal cell carcinoma, peripheral nerve metastasis, hand

Introduction

Metastatic spread of cancer to the hand represents 0.1% of all hand tumors,¹¹ most commonly affecting the bones¹¹ and less frequently the soft tissue.^{2,3,10,11,17,26,27} Recent studies reveal that lung, gastrointestinal tract, and renal cancers are the leading malignancies accounting for metastatic tumors to the hand and wrist.¹

Endoneural metastasis to peripheral nerves is extremely rare, occurring more frequently with hematologic malignancies, known as neurolymphomatosis, than with solid tumors.⁶ Neurolymphomatosis has been described to occur in multiple segments of the peripheral nervous system in the upper extremity, including the brachial plexus trunk,¹⁴ radial nerve at the level of the spiral groove,²² median nerve at the proximal forearm,²³ and median nerve in the hand.¹²

Descriptions of endoneural solid tumor metastases to the nerves of the upper extremity, in contrast, are more rare, and include the brachial plexus trunk,¹⁴ and a case of carcinoid metastasis to the ipsilateral musculocutaneous and proximal ulnar nerves.⁷ Endoneural metastasis from renal cell carcinoma (RCC) has been shown to occur in the cauda equina,^{8,13} lumbosacral nerve roots,^{4,18} and the sciatic nerve²⁴; however, descriptions of RCC invasion of upper extremity nerves are absent.

To our knowledge, there are no cases in the literature describing endoneural solid cancer metastasis to the peripheral nerves of the hand. We present a case of endoneural metastatic RCC to the distal ulnar nerve in a patient with known Stage IV disease.

Case Description

A 69-year-old right-hand-dominant male presented with a 2-week history of a painful, rapidly growing mass located at the right volar ulnar wrist. Pain radiated proximally to the medial forearm and distally to the small finger and ulnar half of the ring finger. He denied history of local trauma. He previously underwent a left complete nephrectomy for renal clear cell carcinoma (1998), and subsequently a right inferior pole nephrectomy (2000) and right lung lower lobectomy for metastatic disease (2004). He had undergone

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Figure 1. MRI images of the right wrist mass, $2.3 \times 1.6 \times 4$ cm in size, located between FCU and FD tendons in the expected location of the ulnar nerve and artery, extending to the level of the FCU tendon insertion on the pisiform. T2-weighted image, (a) coronal; (b) transverse, heterogeneous, hyperintense mass. T1-weighted image; (c) coronal; (d) transverse, mass with intermediate signal intensity, slightly hyperintense to muscle.

Note. MRI, magnetic resonance imaging; FCU, flexor carpi ulnaris; FD, flexor digitorum.

multiple chemotherapeutic regimens, and was being treated with pazopanib at the time of presentation.

Clinical examination revealed a palpable, nonpulsatile, mobile mass measuring 3×3 cm in size located on the volar ulnar aspect of the wrist deep to the flexor carpi ulnaris (FCU) tendon. The mass did not appear to move with the tendon. The skin overlying the mass was normal. Percussion over the mass elicited pain, but no Tinel's sign. He demonstrated full strength of the intrinsic and extrinsic muscles of the right hand. Sensation to light touch was intact in the radial, ulnar, and median nerve distributions, and the 2-point discrimination of the radial and ulnar aspects of all digits was 5 mm. Ulnar and radial pulses were palpable and strong. Allen's test revealed an intact superficial palmar arch with predominant filling of the hand from the radial side, and less from the ulnar side.

Magnetic resonance imaging of the wrist revealed a heterogeneous mass measuring up to $2.3 \times 1.6 \times 4$ cm in size on the volar aspect of the wrist extending along the length

of the ulnar artery and nerve to the level of Guyon's canal, with radial and volar displacement of flexor digitorum and FCU tendons, respectively (Figure 1). Computed tomography scan confirmed the size and location of the mass without osseous abnormalities.

An incisional biopsy was performed through a longitudinal incision directly overlying the palpable mass on the ulnar side of the wrist. The mass was found to be endoneurial, located between and adherent to fascicles of the ulnar nerve, and was adherent to the ulnar artery. Notably, the mass was very hypervascular on obtaining incisional biopsy. An interfascicular segment of the mass was sent for frozen section, which demonstrated a clear cell neoplasm. The procedure was terminated at this point to confirm the diagnosis. Immunohistochemistry confirmed metastatic renal clear cell carcinoma (Figure 2). Histologic sections showed metastatic clear cell carcinoma cells infiltrating nerve and surrounding soft tissue (Figure 2a-b). Tumor cells were positive for high molecular weight keratin, CD10, and vimentin and

Figure 2. Pathologic images of clear cell carcinoma metastasis. (a) Clear cell carcinoma metastatic to soft tissue (H&E stain, power view $\times 100$). (b) Clear cell carcinoma invading nerve (H&E stain, power view $\times 100$). (c) S100 highlights nerve invaded by clear carcinoma cells (immunostain S100, power view $\times 100$). Note. H&E, hematoxylin-eosin.

negative for S100. These immunoprofile, morphologic features and clinical history of renal clear cell carcinoma were consistent with metastatic RCC to the nerve. S100 stain revealed tumor cell invasion of nerve tissue (Figure 2c).

Macroscopic excision of the tumor, in this case, would have offered no survival benefit to the patient, and would also have likely resulted in permanent hand dysfunction. Thus, the treatment of choice for the patient was radiation therapy, to which he had a complete clinical response. In addition, the

patient was initiated on and continues to be treated with an oral chemotherapy agent, axitinib. His most recent follow-up was 4 months postprocedure. At this point, his pain had resolved, the mass was clinically absent on physical exam, and he did not experience loss of hand function. Sensation to all digits was intact to 5 mm of 2-point discrimination. The patient did have some ulnar palm anesthesia to light touch.

Following complete clinical resolution of the mass, no further scheduled follow-up with orthopedic surgery was recommended after the 4-month time period. He was instructed to alert his medical and surgical team if he developed any new soft tissue masses or bone pain, and continues to follow with a medical oncologist in our health system. Imaging follow-up was considered but felt unnecessary, given the complete clinical resolution with no residual symptoms of pain or nerve dysfunction, with the exception of slight ulnar palm anesthesia to light touch.

Discussion

This report describes an endoneural solid tumor metastasis—in this case of RCC—to a peripheral nerve of the wrist and hand. RCC represents 3% of all adult malignancies, with the clear cell carcinoma histologic subtype accounting for 80% of cases.¹⁵ RCC is an aggressive solid cancer, with frequent metastasis occurring even years after treatment of the primary tumor.^{15,16} RCC metastasis occurs most commonly to the lung and bone, and infrequently to the central nervous system, which accounts for only 3% of RCC metastases.¹⁶

The most commonly described cancer metastases sites in the hand occur in bone, and less commonly involve the soft tissue,⁹ with RCC accounting for 11% of the metastases.⁹ A review of the literature revealed 23 cases of RCC metastases to the bones of the hand,²¹ which have included the carpals,²⁰ metacarpals,¹⁹ and phalanges.⁵ RCC metastases have been reported in the subungual region,²⁵ soft tissue pulp,²⁶ small finger,³ and hypothenar² tissue, as well as the soft tissue of the palm leading to median and ulnar nerve compression.²⁶

In general, metastatic tumors to the peripheral nerves may cause symptoms in one of three ways: (1) nerve stretching, (2) nerve compression via mass effect without perineural invasion, or (3) endoneural invasion between fascicles.¹ Both hematologic and solid tumor infiltration of peripheral nerves has been described. Solid tumor invasion is much less common than neurolymphomatosis, and typically occurs in the proximal peripheral nervous system, at the skull base, head and neck region, and brachial and lumbosacral plexuses.⁶

Case reports of solid tumor invasion of the more distal peripheral nervous system causing mononeuropathies are scarce.^{7,24} Endoneural RCC has been documented in the cauda equina,^{8,13} lumbosacral nerve roots,^{4,18} and the sciatic nerve.²⁴ Neurolymphomatoses of the upper extremity have been reported on a few occasions, involving the brachial plexus trunk,¹ radial nerve at the level of the arm,²² and

median nerve of the forearm²³ and hand.¹² Only one report exists describing endoneural solid carcinoid tumor metastasis to the musculocutaneous nerve, and ipsilateral intrafascicular metastasis to the ulnar nerve at the proximal bicipital ulnar nerve sulcus.⁷ Thus, solid tumor metastases, although exceedingly rare, must be considered in the differential diagnosis of a patient with previous cancer history presenting with a wrist or hand mass associated with peripheral neuropathy.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

Statement of Informed Consent

Informed consent was obtained from all patients for being included in the study.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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