MP14-15: The Spinal Distribution of Metastatic Renal Cell Carcinoma: Support for Locoregional Rather than Arterial Hematogenous Mode of Early Bony Dissemination

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Introduction

- Bony metastasis is a severe and life-limiting complication of cancer, resulting in intractable pain, fractures, and limited mobility, and is associated with earlier death in a variety of malignancies
- Twenty-percent of patients with metastatic renal cell carcinoma (mRCC) to the spine experience skeletal related events (SRE's)
- Understanding mechanisms of metastasis may allow for development of improved prognostic tools for identifying patients at risk of SRE's, and ultimately of antimetastatic therapy
- We investigate the distribution of spinal metastasis in mRCC and explore the relationship between biological and clinical factors and patterns of spinal spread

Methods

- Patients with mRCC and spinal involvement were identified from an institutional database
- Clinical and biologic features including primary tumor size and degree of spinal and non-bony metastatic involvement were collected
- Spinal distributions were evaluated by the Kolmogorov Smirnov test, with the null hypothesis that metastases are distributed uniformly across levels
- Distributions were compared across radiographic and clinical parameters

Fig 1: Distribution of spinal metastasis across cohort (n = 100; $p < 0.001$)

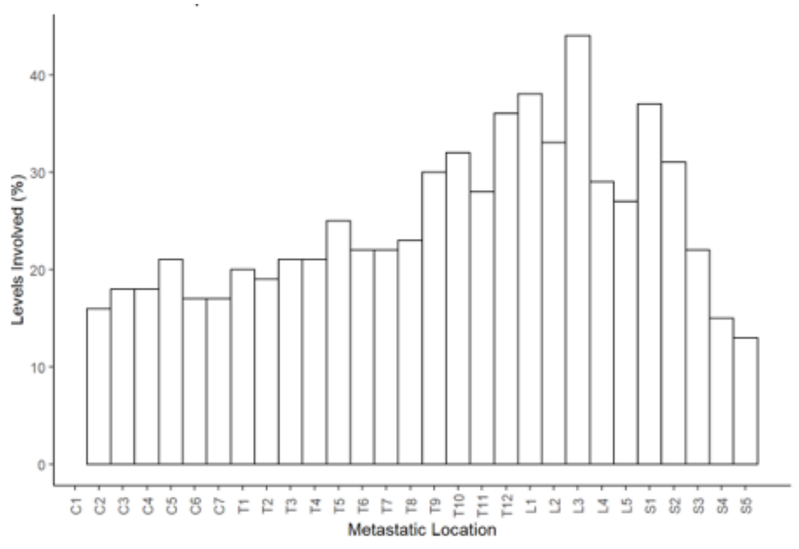


Fig 2: Differences in spinal metastatic distribution by tumor size (<4 cm vs. >7 cm, $p < 0.001$)

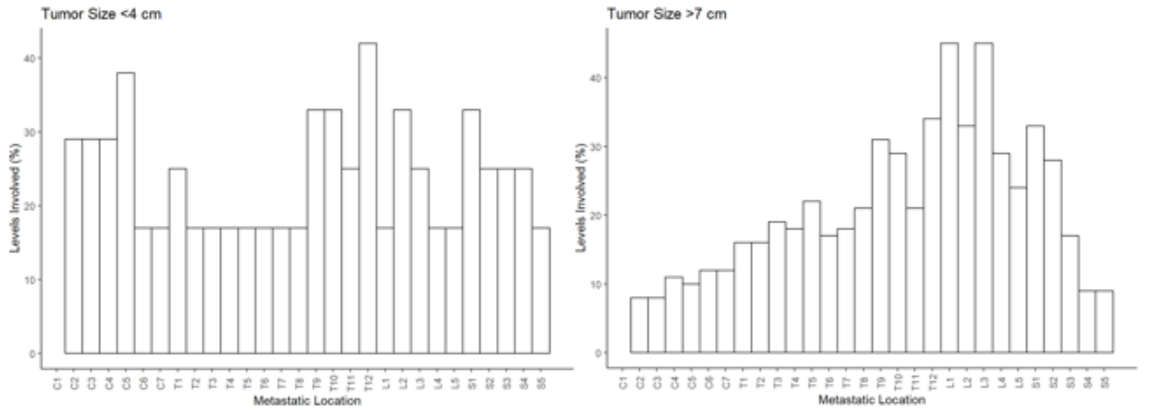
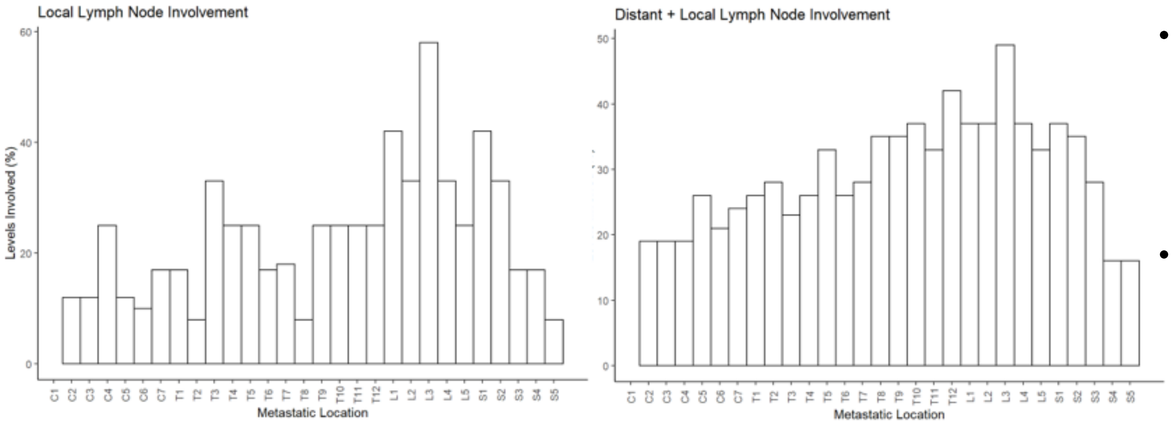


Fig 3: Differences in spinal metastatic distribution in patients with regional lymph node metastasis vs. distant extra-osseous spread ($p = 0.015$)



Results

- One-hundred patients with 685 spinal levels involved by mRCC were evaluated; 68% male, and 71% clear cell histologic subtype
- A nonuniform spatial distribution was observed across the cohort ($p < 0.001$); a preponderance of thoracolumbar involvement was noted with the mode at L3 **(Fig 1)**
- No difference in metastatic distribution was observed in right vs. left-sided tumors or for clear cell vs. non-clear cell renal cell histology ($p = 0.99$ and $p = 0.66$, respectively)
- Patients with smaller tumors (<4cm compared to >7cm) **(Fig 2),** those with distant spread **(Fig 3),** and patients with greater number of involved spine levels (1 vs. >5 levels) had significantly more uniform distributions of spinal metastasis ($p < 0.001$, $p = 0.015$, and $p < 0.001$, respectively)

Conclusions

- Our data support a dominant locoregional as opposed to arterial hematogenous mechanism for early dissemination of mRCC to the spine
- This is concordant with the theory of the valveless Batson plexus acting as a conduit for such spread, as the kidneys are compartmentally distinct from, but reside just anterior to the spine at L1-L3
- Characterizations of the biologic molecular features contributing to osseous tropism and aggressive tumor biology are an area of active investigation