



Metastatic Spine Disease: Current Trends and Research

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Editorial

The last two decades has seen dramatic advancement in the diagnosis and treatment of metastatic spine disease. The paradigm changing publication by Roy Patchell et al. [1] validated the feelings of many spine surgeons that properly chosen surgery in combination with radiation could enhance functional recovery and preserve function for longer than prior combined modalities. The next frontier in spine tumor surgery is to better define when we should operate and on whom, two closely linked concepts.

Strategies and treatment modalities for metastatic cancer have significantly improved in the past few decades and have resulted in dramatic changes in overall survival rates for such patients. With an incidence of spinal metastases has been noted in up to 40% of cancer patients, this improved survival has lead to a higher incidence and prevalence of symptomatic spinal metastases [2-5]. Certain common cancers such as renal cell carcinoma have a strong predilection for bone and while treatments have dramatically improved in the last decade, there is a recognized difference in efficacy on soft tissue metastases and bone metastases [6]. This only contributes to the burden of boney disease for these patients.

Prognostic tools have continued to evolve as oncologic treatments and surgical modalities continue to improve [7-9]. However, with survival rates that have been reported to be anywhere from a few months to a few years at best [10,11], it is imperative to evaluate patients' functional status and describe how surgical intervention can affect this aspect of their quality of life following diagnosis and treatment.

There have been several important contributions to the literature since the Patchell study that continues to advance our understanding of surgical indications. One of these is focused on the role of stability and attempts to classify spinal stability using a novel classification system [12-14]. This study follows a trend in the treatment of orphan diseases combining best available evidence and expert consensus. This model is further validated by intra-observer and inter-observer reliability studies as the algorithm is tested in several subspecialties [15,16].

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One significant barrier to establishing clear treatment algorithms for metastatic spine tumors is significant disease and treatment heterogeneity. Extrapolating from the oncology literature, local recurrence or disease persistence tends to be heavily influenced by surgical margins. One of the significant limitations seen in the metastatic spine tumor literature is a lack of defined margins and correlation with local control. Treatment algorithms such as those created by Tokahahi and Tomita guide the practitioner guidelines regarding the resection type (wide, marginal, intralesional) based on the patient's prognosis [9,17]. Many experienced spine tumor surgeons prefer an enbloc type approach for a majority of patients but there is not a clear clinical scenario where this should be employed as best practice. By definition, these patients have Stage IV disease and their likelihood of cure is extremely low (~10%) even in low volume disease.

The other major barrier to defining a single common algorithm for these patients is the variable natural histories of different tumor types and the differences in relative radio-sensitivity of different tumors, which can have a major effect on the need for definitive or more aggressive resections. For example, a highly chemo-sensitive and radiosensitive tumor such as multiple myeloma may need a stabilization procedure for instability but may not need any attempt at resection for a long-term success. In contrast, a solitary renal cell carcinoma metastasis (low chemo and radio-sensitivity) [6] may need a definitive wide resection for durable long-term control.

At our center, current research efforts are focused on trying to identify modes of failure stratified by tumor subtypes and disease status. Early evidence has pointed to this expected heterogeneity of outcomes with trends emerging by tumor type and duration of survival. There is a large group that has an average survival of less than 18 months that probably could be treated in a variety of

ways with little change in ultimate outcome. On the other hand, the group demonstrating longer-term survival is at higher risk of needing a revision operation.

One of the common reasons for failure in degenerative spine surgery is non-union. We are also evaluating what role this plays in surgery for metastatic spine tumors. This is not a dominant mode of failure and is under further investigation. This also creates a potential opportunity for cost savings as the majority of spine surgeons utilize adjuvant strategies for achieving fusion such as autograft, allograft and even biologics that may not be necessary.

What does seem clear from our current work is that to make meaningful contributions to the treatment algorithms for metastatic spine tumors, we will need more collaborative work across busy centers using similar decision-making points. While Patchell and colleagues did address the differences in some tumor histologies (excluding highly radio-sensitive tumors such as lymphoma and myeloma), this was probably not enough to address the variability in long-term survival and functional status of patients. The role of disease heterogeneity is probably more influential on outcomes than any study has really evaluated to date. Tatsui et al. [10] have looked at this phenomenon in their study looking at prognostic factors for survival for a single disease state. This is an area of interest for future work for many of the most common tumor subtypes.

Metastatic spine disease has significant influence on functional status and quality of life for patients. This is compounded by the high costs frequently associated with these interventions. As medicine cones down its focus on value in medical services, we need to continue to evaluate the relationship of outcomes and costs for these patients.

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