# Contemporary surgical strategies for spinal metastasis; case closed?

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*Comment on:* Hansen-Algenstaedt N, Kwan MK, Algenstaedt P, *et al.* Comparison Between Minimally Invasive Surgery and Conventional Open Surgery for Patients With Spinal Metastasis: A Prospective Propensity Score-Matched Study. Spine (Phila Pa 1976) 2017;42:789-97.

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Minimally invasive surgery (MIS) approaches for degenerative spinal conditions are commonplace, but its application in spinal oncology is still in its early stages (1-5). Miscusi *et al.* compared open to minimally invasive approaches for thoracic metastasis causing acute myelopathy and concluded that MIS techniques are superior to open approaches with; less blood loss, operation time and bed rest length, as well as less postoperative pain and better European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ C30 scores) (6).

Hansen-Algenstaedt *et al.* report a prospectively non-randomized, propensity cohort study comparing 30 MIS and 30 open surgery thoracic and lumbar spinal metastasis patients from two international centers, from January 2008 to December 2010 to determine the difference in surgical and clinical outcomes. The power analysis indicated at least 17 patients were needed for statistical significance. The decision to operate was made by an interdisciplinary team. The authors collected and analyzed demographic as well as operative data. Demographic and preoperative data collected included: height, sex, age, weight, BMI, tumor type, Tomita, Tokuhashi, Eastern Cooperative Oncology Group (ECOG), visual analogue scale (VSA), Karnosky and American Society of Anesthesiologists (ASA) scores, whether preoperative embolization, chemo or radiotherapy occurred, Frankel grade, as well as hemoglobin, myoglobin and creatine kinase levels. Operative and perioperative data collected included: number of instrumented or decompressed segments, whether posterior decompression occurred, number and types of anterior reconstruction, total screws used, operative time, blood loss, total units of blood transfused, fluoroscopy time, surgical related complications and length of intensive care unit as well as hospitalization stay. Postoperative data collected included: Frankel and VAS score at 7 days, ECOG, Frankel, VAS and Karnofsky score at 3 months, hemoglobin, myoglobin and creatinine kinase levels at 1 day and myoglobin and creatinine kinase levels at 3 days postop. The propensity score was estimated using logistic regression based on age, tumor type, Tokuhashi and Tomita score, and patients were then manually matched using nearest-neighbor matching (7).

The results demonstrated no significant difference between the two groups in demographic and preoperative parameters. However, the MIS group had longer instrumented and shorter decompressed segments, as well as less posterior decompressions, fluoroscopy time, blood loss and need for transfusions, a shorter hospital stay and less time to initiation of adjunctive radiation and chemotherapy due to a faster recovery time, as well as statistically significantly improved average pain score at 3 months. The results also showed that there was no difference in anterior reconstruction, number of screws used, operative time, complications, intensive care unit stay, ECOG, Frankel grade, Karnosky and VAS score (6). These findings of superiority of MIS versus open approaches for spinal tumors have been echoed in previously published studies of MIS surgery for spinal tumors (6,8-10).

This study was well designed and seemingly well executed with prospective data collection of many variables over two international sites. The main strength of this paper lies in its prospective propensity cohort design. The primary advantage of a propensity score is that it emulates some of the characteristics of a randomized controlled study, by closely matching patient variables as much as possible within the constraints of an observational study (11). By creating balanced cohorts, differences observed may be more reliable, though some bias in unknown variables may still be present.

Drawbacks of this study include the selection bias inherent in the surgeon's decision to perform either MIS or open surgery to begin with, as well as the potential variation in surgeon technique and experience with each procedure. Also, outcomes can be heavily influenced by histopathologic type of tumor and overall stage of disease, which was not incorporated in the matching process. This would have significant impact if MIS patients tended to have better pathology types and more limited metastatic disease than open surgery patients.

Nevertheless, the results of this prospective, propensity matched cohort study echoes the results of other studies comparing MIS vs open surgery in spinal disorders. MIS surgery has repeatedly shown less blood loss, shorter operating room time and faster hospital stays, but there is typically a learning curve that needs to be overcome before achieving those results. With further advances in surgical technique and equipment as well as with improved systemic cancer care with targeted treatments, the role of less invasive surgery for spinal metastasis will likely only become more relevant in years to come (6,8-10,12-16).

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