

**Title: A health services comparison of surgery followed by radiation therapy versus radiation therapy alone for patients with metastatic epidural spinal cord compression**

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**Background:** Metastatic epidural spinal cord compression (MESCC) is a serious complication of metastatic cancer caused by tumor incarcerating the neural elements within the spinal canal. The benefits of surgery have been reported for select groups of patients, however, there is evidence demonstrating the increasing use of surgery for groups of patients that are not likely to benefit from this type of intervention. Despite numerous case series and a randomized controlled trial, we are still challenged with defining the appropriate role of surgery in this heterogeneous patient population. If the goal of the intervention is to improve outcomes and the quality of life for patients with MESCC, what are the metrics by which we should measure their outcomes and qualities of life? Crudely defined measures of functional outcome, e.g. the ability to take 4 steps, are often used as primary endpoints in assessing treatments for MESCC. Whether these interventions truly impact a person's functional outcome and quality of life is still generally unknown. Health services resource utilization patterns, e.g. number of inpatient days, need for physical therapy or devices, may provide additional insight into the impact of surgical interventions.

**Purpose:** Our objective was to compare the utilization of resources among patients with metastatic epidural spinal cord compression (MESCC) treated with surgery followed by radiotherapy (RT) versus those treated with RT alone.

**Methods:** We performed a retrospective cohort study using the 1991 – 2009 SEER-Medicare database, the 2000 – 2007 Texas Cancer Registry (TCR), and the 2000 – 2011 MarketScan Commercial Claims and Encounters database. We identified patients diagnosed with pathologically confirmed lung, breast, prostate, colorectal, and pancreas cancers between January 1, 1991 and December 31, 2009. Metastatic epidural spinal cord compression was defined by ICD-9 diagnosis codes as was treatment course and device and ancillary services use within a six month window after diagnosis. Radiation therapy, spinal cord decompression surgery, and utilization of inpatient care, ancillary services, and devices were determined using common procedural terminology (CPT) codes. Multivariable logistic regression and negative binomial regression models were used to analyze claims data. Costs were normalized to the 2015 dollar.

**Results:** Of 3087 patients, 2066 (66.9%) were covered by Medicare and 1021 (33.1%) were covered by private insurance. A higher proportion of younger patients underwent surgery followed by RT than RT alone for their

MESCC: 18.5% of patients aged 15-64 compared to 11.1% of patients aged 65-75, and 8.1% of patients aged  $\geq 76$ . About 18.5% of privately insured patients received surgery followed by RT compared to 9.8% of Medicare patients. Surgery followed by RT was the more likely treatment strategy for patients with no comorbidity. Surgery followed by RT was a significant predictor for higher number of physical therapy claims (Rate Ratio [IRR] = 1.75;  $P < 0.0001$ ), more hospital days after the completion of acute management of MESCC (RR = 1.17;  $P < 0.0001$ ), and more number of skilled nursing facility (SNF) days after completion of RT (RR = 1.21;  $P < 0.0001$ ). Elder patients had a higher number of SNF days (RR=3.62,  $P < 0.0001$  for age 65-75; RR = 3.46,  $P < 0.0001$  for age  $\geq 76$ ) and higher number of hospitalization days (RR=1.26,  $P < 0.0001$  for age 65-75; RR = 1.08,  $P = 0.0002$  for age  $\geq 76$ ). The six month mean overall costs of care after spinal cord compression was \$53,428 for patients who received radiation therapy alone and \$122,159 for patients who received surgery followed with radiation therapy (Wilcoxon two-sample test,  $P < 0.0001$ ).

**Conclusions:** Metastatic epidural spinal cord compression has increasingly been treated with surgery plus postoperative radiotherapy rather than radiotherapy alone. Surgery was more commonly used in MESCC patients with private insurance as compared to those with Medicare. Inclusion of surgery in the management of MESCC was associated with increased use of physical therapy, prolonged hospitalizations, time spent in SNFs, and cost of care. This data, in addition to clinically-reported functional and quality of life measures, may be used to inform providers and counsel patients regarding management options for metastatic epidural spinal cord compression.

Level III