Purpose: To compare the dose distributions depending on the patient positions in robotic radiation surgery or therapy of spine metastases and to provide an alternative compensating the insufficient tumor coverage of supine setup.

Methods: A chest phantom (CIRS Inc., Norfolk, VA) was used to mimic three patient positions, supine, prone, and lateral. Three-dimensional computed tomography (CT) images of each patient position were obtained, and the same gross tumor volume (GTV), spinal cord and lung were delineated in the MuliPlan, a CyberKnife treatment planning system. GTV covered whole vertebral body and spinal cord was equally separated from the GTV in three patient positions. Non-isocentric and inverse planning was performed with Ray tracing and Monte Carlo algorithm, respectively. Five independent plans were built for each position to make the calculated dose distribution statistically meaningful. GTV was prescribed with 24 Gy in three fractions to the 80% isodose line in the first optimization step without any beam reduction. Coverage and conformality of GTV, V18 of spinal cord, V10 and V5 of each lung were compared under the same dose prescription.

Results: The delineated volumes of GTV had 0.02% of standard deviation with respect to its average volume. In prone position, tumor coverage was the highest and V18 of spinal cord was much lower than that of supine whereas the conformality index (CI) was relatively higher because of its highest tumor coverage. V10 and V5 of each lung were also the lowest in prone. In lateral position, all values were good but tumor coverage was almost 10% lower than that of prone.

Conclusions: Prone position showed the most excellent dose distribution in robotic radiotherapy plans for spine metastases. If the supine setup is inevitable, CT scan range has to be extended more into superior-inferior (S-I) direction to compensate the lower volume coverage of tumor.

Funding Support, Disclosures, and Conflict of Interest:

This study was funded by Gyeongsang National University Hospital.