Purpose:
Treatment planning systems have provided Monte Carlo dose calculations for several years but many physicians are still hesitant to use them clinically due to lack of data. Therefore we recalculated 200 Ray Tracing treatment plans using Monte Carlo with heterogeneity corrections and compared to SBRT dose tolerance limits.

Methods:
From among these 200 CyberKnife cases, 25 mediastinal lung cases are presented in this study. An extensive literature review obtained 105 published SBRT dose tolerance limits for the mediastinal critical structures aorta, bronchi, esophagus, heart, and trachea. These limits were partitioned into high-risk and low-risk categories. The DVH Evaluator software tool was used to generate DVH Risk Maps for these critical structures, which superimpose a) published dose tolerance limits b) unified high-risk and low-risk trends and c) published adverse event doses, onto Monte Carlo patient data to assess risk of adverse events.

Results:
Recalculated treatment plan data is within the expected range of published SBRT dose tolerance limits, providing optimism for clinical use. None of the patients experienced any Grade 3 or higher adverse events. The low-risk dose tolerance limits were exceeded 22 times in these cases with no severe adverse event, thus helping to validate their safety.

Conclusions:
The range of doses calculated by Monte Carlo for our historical patient data is compatible with published SBRT dose tolerance limits. SBRT dose tolerance limits should be fine-tuned by Monte Carlo dose calculations in long-term statistical followup studies.

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Disclosure: The first author has developed the DVH Evaluator software.