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Abstract

# The Lessons of QUANTEC Reproduced in HyTEC

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## Abstract

Objectives: To assess whether intracranial stereotactic radiotherapy results are reported using methodology sufficient to allow comparison of outcomes with varying treatment approaches. The analysis of QUANTEC was so profoundly limited by the difficulty of synthesizing results from different publications, that a QUANTEC Vision Paper (IJROBP 2010 Mar 1;76(3 Suppl):S155-60) was published to address this limitation and recommend reporting standards that would increase the utility of future studies for subsequent analysis. Unfortunately, eight years later these problems still persist in the published data, limiting the HyTEC (Hypofractionated Treatment Effects in the Clinic) effort. Here we assess the adoption of these standards and impact.

Methods: Dose, fractionation, and tumor size radiosurgery data for brain metastases were extracted from the published literature via PubMed search. Compiled data were compared radiosurgery outcomes for 150 resection cavities from our own institution. Logistic dose-response models were constructed, stratified by tumor size, histology, and fractionation as possible from the limitations of the data.

Results: A PubMed search "metastas* AND (radiosurgery OR stereotactic) AND (brain OR cranial)" on Oct 2017 returned 2,998 papers. However, only 58 of them provided sufficient details for dose-response modeling: outcomes stratified by RTOG 90-05 size criteria, prescription dose, and fractionation. The 58 papers contained 81 usable dose / fractionation / size groups comprising 13,900 total patients. Separate models were constructed for small, medium, and large tumors, as well as separate models for 1, 3, and 5 fractions, all in terms of 1-year local control. In our resection cavity institutional population, in terms of three-fraction equivalent 95%tumor coverage dose, minimal dose-response was observed when averaged over the entire cohort, but when stratified by size, the local control dose response of large tumors ranged from 63% at 18Gy to 71% at 25Gy, and the response of small tumors ranged from 85% at 20Gy to 94% at 30Gy. Furthermore, when stratified by histology, metastatic lung tumors did not exhibit substantial dose-response, but when also stratified by RTOG 90-05 size criteria, the response ranged from 75% to 90% local control for these tumors. Our findings provide a potential explanation for reproducibility failure between published studies, since varying proportions of incompatible patient populations are often mixed together. Comparisons will be shown in both the published data and our own institutional cohort in terms of what can be observed and what is lost, by stratifying and combining the data, respectively.

Conclusions: Authors of clinical outcomes studies should present sufficient details of the data to enable future investigators to reproduce or refute the results. We describe important data

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that should be mandated for journal publication of outcomes; in particular: dose, fractionation, endpoint, technology, basic clinical information, and other pertinent information for the anatomical structures of interest should be reported per patient or at least in stratified groups.