INTRODUCTION: Several recent retrospective analyses have shown conflicting correlation of doses of radiotherapy (RT) to SVZ with survival in patients with glioblastoma (GBM). We present the results of a prospective study evaluating RT doses received by SVZ in patients diagnosed with new GBM and analyzed their impact on survival.

MATERIALS AND METHODS: Between 2012-2016, 100 patients with newly diagnosed GBM were accrued in this IRB approved prospective study. 80 patients who completed their adjuvant treatment form the study group for the present analysis. Patients underwent maximal safe surgical resection followed by adjuvant focal conformal RT to a dose of 59.4 Gy/33 fractions with standard concurrent temozolomide and 6-12 adjuvant temozolomide chemotherapy. We did not specifically consider SVZ during RT planning, with the help of internal radiosurgery planning and an in-house software. After segmentation, a database of 90 parameters including geometrical and textural image-based measures together with patients' clinical data (including age, survival, type of treatment, etc.) was constructed, including variables in the following domains: patients' characteristics, treatments given and their repeated administration, and image data acquired using an in-house software. After segmentation, a database of 90 parameters including geometrical and textural image-based measures together with patients' clinical data (including age, survival, type of treatment, etc.) was constructed. These image-based measures were extracted in the first step. Then, high information measures were selected using a forward stepwise feature selection strategy. The selected attributes showing the highest information measures were extracted. In the second phase, more sophisticated learning methods were employed in order to validate the potential of the previous variables predicting survival. The data were pre-processed and further analyzed using various machine learning methods. Using this technique, the high information content and their predictive combined potential. Several of them have focused on including large numbers of variables, mostly two-dimensional textural features and/or genomic data, regardless of their meaning or potential clinical relevance.

RESULTS: Variables showing high information in the first phase provided the best prediction results in the second phase. Specifically, patient age, Stupp regimen and a geometrical measure related with the irregularity of contrast-enhancing areas were the variables showing the highest information measure in the first stage. For the second phase, the combinations of patient age and Stupp regimen together with one tumor geometrical measure and one tumor heterogeneity feature reached the best quality prediction. CONCLUSIONS: Advanced machine learning methods identified the parameters with the highest information measure and survival. The uninformative machine learning methods identified a novel feature measure with direct impact on survival. Used in combination with other previously known variables multi-indexes can be defined that provide an estimate of patient prognosis and survival. Future advances on the definition of those multi-indexes will be reported in the conference.

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