10035 **Poster Session**

A fully automated MRI-based deep-learning algorithm for classifying germinomas and nongerminomatous germ cell tumors.

Yanong Li; Beijing Tiantan Hospital, Beijing, China

Background: Intracranial germ cell tumors (iGCTs) are classified into two pathological subtypes (Germinomas [GEs] and nongerminomatous germ cell tumors [NGGCTs]), with distinct treatment strategies and prognosis. Accurate preoperative determination of iGCT subtypes is essential for clinical decision-making and prognosis assessment. We aim to develop and validate a deep-learning algorithm to automatically segment the iGCTs and classify their subtypes using preoperativeT2-weighted (T2W) images. **Methods:** Brain MR imaging and corresponding pathologic information were retrospectively obtained for 594 iGCTs, including 269 GEs and 325 NGGCTs from Beijing Tiantan Hospital (between January 1, 2008, and October 31, 2020). The retrospective set was subdivided into the training (n = 416) and test (n = 178) sets to develop and test a 3D nnU-Net using T2W images (here we named iGCT-net) for iGCT segmentation and its subtypes (GEs and NGGCTs) classification, simultaneously. A prospective cohort (n = 73, 56 GEs and 17 NGGCTs) was designed as a simulation set to test the model in a simulated clinical application. Dice scores were computed to assess tumor segmentation. Accuracy, sensitivity, specificity, and area under the curve (AUC) were used to assess the GEs and NGGCTs classification. Sensitivity analysis on subgroups with tumor locating at suprasellar, pineal, and basal ganglia in test and simulation set, respectively. **Results:** For tumor segmentation, the iGCT-net achieved a dice score of 0.73 and 0.80 in test and simulation sets, respectively. For GEs and NGGCTs classification in the test set, the iGCT-net achieved an accuracy of 90.96%, sensitivity of 86.84% and specificity of 82.26%, and AUC of 84.87%. The iGCT-net showed 83.65% accuracy in the simulation set, with sensitivity of 83.56% and specificity of 83.72%, and AUC was 81.17%. In sensitivity analysis, the accuracies of the iGCT-net presented for the suprasellar region, pineal region, and basal ganglia region were 86.84%, 92.92%, and 61.73% in the test set, and 92.31%, 88.89%, and 72.27% for suprasellar region, pineal region, and basal ganglia region in the simulation set. **Conclusions:** We developed and validated a fully automatic deep learning algorithm to segment iGCT and classify GEs and NGGCTs with a high accuracy using only T2W images based on a large dataset. Research Sponsor: Grant number: 2020-2-1072.