BraTioUS

Retrospective, multi-institutional observational studies

A retrospective study included patients diagnosed with glioblastoma from the multicenter BraTioUS database. A single 2D iUS slice, showing the largest tumor diameter, was selected for each patient. Radiomic features were extracted and subjected to feature selection, and clinical data were collected. Using a fivefold cross-validation strategy, Cox proportional hazards models were built using radiomic features alone, clinical data alone, and their combination. Model performance was assessed via the concordance index (C-index).

A total of 114 patients met the inclusion criteria, with a mean age of 56.88 years, a median OS of 382 days, and a median preoperative tumor volume of 32.69 cm3. Complete tumor resection was achieved in 51.8% of the patients. In the testing cohort, the combined model achieved a mean C-index of 0.87 (95% CI: 0.76-0.98), outperforming the radiomic model (C-index: 0.72, 95% CI: 0.57-0.86) and the clinical model (C-index: 0.73, 95% CI: 0.60-0.87).

Intraoperative ultrasound relies on acoustic properties for tissue characterization, capturing unique features of glioblastomas. This study demonstrated that radiomic features derived from this imaging modality have the potential to support the development of survival models [1)].

This study makes a significant contribution to the emerging field of intraoperative radiomics by demonstrating the prognostic potential of iUS features in glioblastoma patients. However, its limitations, particularly the small sample size, retrospective design, and lack of external validation, necessitate further research to confirm the findings and establish their clinical utility. By addressing these gaps, future studies can ensure that such models become valuable tools for optimizing treatment strategies in glioblastoma management.

Cepeda et al. retrospectively collected data from the BraTioUS and ReMIND datasets, including histologically confirmed gliomas with high-quality B-mode images. For each patient, the tumor was manually segmented on the 2D slice with its largest diameter. A CNN was trained using the nnU-Net framework. The dataset was stratified by center and divided into training (70%) and testing (30%) subsets, with external validation performed on two independent cohorts: the RESECT-SEG database and the Imperial College NHS Trust London cohort. Performance was evaluated using metrics such as the Dice similarity coefficient (DSC), average symmetric surface distance (ASSD), and 95th percentile Hausdorff distance (HD95). Results: The training cohort consisted of 197 subjects, 56 of whom were in the hold-out testing set and 53 in the external validation cohort. In the hold-out testing set, the model achieved a median DSC of 0.90, ASSD of 8.51, and HD95 of 29.08. On external validation, the model achieved a DSC of 0.65, ASSD of 14.14, and HD95 of 44.02 on the RESECT-SEG database and a DSC of 0.93, ASSD of 8.58, and HD95 of 28.81 on the Imperial-NHS cohort. Conclusions: This study supports the feasibility of CNN-based glioma segmentation in ioUS across multiple centers. Future work should enhance segmentation detail and explore real-time clinical implementation, potentially expanding ioUS's role in neurosurgical resection [2)]

Cepeda et al. provide valuable evidence supporting the potential of CNN-based glioma segmentation in ioUS. The study's strengths lie in its robust methodology and use of external validation cohorts. However, the variability in performance across datasets and the lack of real-time implementation highlight areas for improvement. Future studies should aim to enhance segmentation detail, address inter-institutional variability, and explore practical applications in the operating room. With these refinements, CNN-based segmentation could become a transformative tool in neurosurgical oncology.

[1]

Cepeda S, Esteban-Sinovas O, Singh V, Moiyadi A, Zemmoura I, Del Bene M, Barbotti A, DiMeco F, West TR, Nahed BV, Giammalva GR, Arrese I, Sarabia R. Prognostic Modeling of Overall Survival in Glioblastoma Using Radiomic Features Derived from Intraoperative Ultrasound: A Multi-Institutional Study. Cancers (Basel). 2025 Jan 16;17(2):280. doi: 10.3390/cancers17020280. PMID: 39858063.

[2]

Cepeda S, Esteban-Sinovas O, Singh V, Shetty P, Moiyadi A, Dixon L, Weld A, Anichini G, Giannarou S, Camp S, Zemmoura I, Giammalva GR, Del Bene M, Barbotti A, DiMeco F, West TR, Nahed BV, Romero R, Arrese I, Hornero R, Sarabia R. Deep Learning-Based Glioma Segmentation of 2D Intraoperative Ultrasound Images: A Multicenter Study Using the Brain Tumor Intraoperative Ultrasound Database (BraTioUS). Cancers (Basel). 2025 Jan 19;17(2):315. doi: 10.3390/cancers17020315. PMID: 39858097.