A quantitative comparison of cognitive performance and patient-reported symptoms in preoperative lower-grade glioma patients from two Dutch Hospitals

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and suggestive symptoms are associated with NM, we found very poor Sn/Sp for elevated protein (61%/61%), low glucose (35%/85%), elevated lactate (35%/91%), and symptoms consistent with NM (74%/73%). Of these values, only an elevated lactate and symptoms were even marginally helpful in predicting a positive CSF cytology. No variable predicted a negative cytology, and 22.8% of patients with a positive CSF cytology had completely normal CSF findings. CONCLUSION: Generally accepted concepts about the frequency of CSF and clinical findings in patients with suspected NM are based on biased estimates in the literature. No CSF chemistry or clinical finding reliably predicts the presence of NM, and almost a quarter of patients with cytologically proven NM have completely normal findings. In patients with positive CSF cytologies, about 73% are detected after one LP, and more than 90% after 3, but again these findings represent overestimates because of pervasive spectrum bias and differences in sample acquisition/handling. Better diagnostic techniques are desperately needed.

POSTER PRESENTATIONS

P01 COGNITION IN BRAIN TUMORS

P01.01.A. LESION-FUNCTION ANALYSIS FROM MULTIMODAL IMAGING AND NORMATIVE BRAIN ATLASES FOR PREDICTION OF COGNITIVE DEFICITS IN GLIOMA PATIENTS

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BACKGROUND: Cognitive deficits are common in glioma patients following multimodality therapy, but the relative impact of different types and locations of treatment-related brain damage and recurrent tumors on cognition is not well understood. MATERIAL AND METHODS: In 121 WHO Grade III/IV glioma patients, structural MRI, O-(2-[18F]fluoroethyl)-L-tyrosine FET-PET, and neuropsychological testing were performed at a median interval of 14 months (range, 1-214 months) after therapy initiation. Resection cavities, T1-enhancing lesions, T2/FLAIR hyperintensities, and FET-PET positive tumor sites were semiautomatically segmented and elastically registered to a normative, resting state (RS) fMRI-based functional cortical network atlas and to the JHU atlas of white matter (WM) tracts, and their influence on cognitive test scores relative to a cohort of matched healthy subjects was assessed. RESULTS: T2/FLAIR hyperintensities presumably caused by radiation therapy covered more extensive brain areas than the other lesion types and significantly impaired cognitive performance in many domains when affecting left-hemispheric RS-nodes and WM-tracts as opposed to brain tissue damage caused by resection or recurrent tumors. Verbal episodic memory proved to be especially vulnerable to T2/FLAIR abnormalities affecting the nodes and tracts of the left temporal lobe. CONCLUSION: In order to improve radiotherapy planning, publicly available brain atlases, in conjunction with elastic registration techniques, should be used, similar to neuronavigation in neurosurgery.

P01.02.B. CASE REPORT: DISRUPTION OF RESTING-STATE NETWORKS AND COGNITIVE DEFICITS AFTER WHOLE BRAIN IRRADIATION FOR SINGULAR BRAIN METASTASIS

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BACKGROUND: Long-term survivors of whole brain radiation (WBRT) are at significant risk for developing cognitive deficits, but knowledge about the underlying pathophysiological mechanisms is limited. Therefore, we here report a rare case with a singular brain metastasis treated by resection and WBRT that survived for more than 10 years where we investigated the integrity of brain networks using resting-state functional MRI. MATERIAL AND METHODS: A female patient with a left frontal non-small cell lung cancer (NSCLC) brain metastasis had resection and postoperative WBRT (30.0 in 3.0Gy fractions) and stayed free from brain metastasis recurrence for a follow-up period of 11 years. Structural magnetic resonance imaging (MRI) and amino acid [O-(2-[18F]fluoroethyl)-L-tyrosine] positron emission tomography (FET PET) were repeatedly acquired. At the last follow up, neurocognitive functions and resting-state functional connectivity (RSFC) using resting-state fMRI were assessed. Within-network and inter-network connectivity of seven resting-state networks were computed from a connect-

ivity matrix. All measures were compared to a matched group of 10 female healthy subjects. RESULTS: At the 11-year follow-up, T2/FLAIR MR images of the patient showed extended regions of hyper-intensities covering mainly the white matter of the bilateral dorsal frontal and parietal lobes while sparing most of the temporal lobes. Compared to the healthy subjects, the patient performed significantly worse in all cognitive domains that included executive functions, attention and processing speed, while verbal working memory, verbal episodic memory, and visual working memory were left mostly unaffected. The connectivity matrix showed a heavily disturbed pattern with a widely distributed, scattered loss of RSFC. The within-network RSFC revealed a significant loss of connectivity within all seven networks where the dorsal attention and fronto-parietal
control networks were affected most severely. The inter-network RSFC was significantly reduced for the visual, somato-motor, and dorsal and ventral attention networks. CONCLUSION: As demonstrated here in a patient with a metastatic NSCLC and long-term survival, WBRT may lead to extended white matter damage and cause severe disruption of the RSFC in multiple resting state networks. In consequence, executive functioning which is assumed to depend on the interaction of several networks may be severely impaired following WBRT apart from the well-recognized deficits in memory function.

P01.03.B. A QUANTITATIVE COMPARISON OF COGNITIVE PERFORMANCE AND PATIENT-REPORTED SYMPTOMS IN PREOPERATIVE LOWER-GRADE GLIOMA PATIENTS FROM TWO DUTCH HOSPITALS.

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BACKGROUND: Protocols for assessment of (neuro)psychological outcomes in lower-grade glioma patients vary between hospitals. This potentially complicates generalization of these outcomes. We compared standardized scores on tests of two frequently impaired cognitive domains (attention and executive functioning (EF)), and two relevant patient-reported outcomes (PROs; depression and fatigue) of two neuro-oncological hospitals that use different measurement instruments. MATERIAL AND METHODS: Data were used from preoperative assessments of patients with (IDH-mut) WHO grade II/III glioma tested between 2007 and 2021 at Amsterdam UMC (AMS) or at Elisabeth-Tweesteden Hospital Tilburg (ETZ). AMS patients were referred for (neuro)psychological assessment based on physician and patient preference (paper and pencil tests), whereas all ETZ patients routinely undergo screening (computerized tests). To compare scores of the different attention and EF tests we converted patients' performances to z-scores based on normative data. For cognitive performance, we compared scores of different cognitive flexibility tests (CST vs SAT), processing speed tests (SDC vs LDMT), and Stroop tests (Stroop I and Stroop III). PROs included the CES-D vs HADS-D and the CIS-fatigue vs MVI-general fatigue (AMS vs ETZ, resp.). Differences were tested using Fisher's, χ^2, and Mann-Whitney U tests. RESULTS: Assessments were done median 4 weeks (AMS, n=97, range 19-0 weeks) and 1 day (ETZ, n=106; range 14-0 days) preoperatively. Age, sex, tumor location and histology were comparable between cohorts (p>0.05), but the AMS cohort showed significantly more grade III tumors (36% vs 16%) and more awake surgeries (84% vs 46%). Z-scores measuring attention and EF (n=94 and n=95, AMS vs ETZ) were not significantly different (CST vs SAT, percentage with a disorder (z <-1.5SD) 15% vs 13%; SDC vs LDMT 13% vs 14%; Stroop I 11% vs 18%; Stroop III 13% vs 16% at AMS and ETZ, resp.). Percentages of patients with possible depression (CES-D≥16, n=88 and HADS-D≥8, n=106) did not differ significantly between hospitals (28% vs 26%), nor did percentages of patients with severe fatigue (CIS-fatigue≥35, n=88 and MVI-general fatigue (z <-1.5SD), n=38, 42% vs 24% at AMS and ETZ, resp.). CONCLUSION: Standardized scores of glioma patients on cognitive domains (attention and EF) and PROs (depression and fatigue) did not differ between two centers with slightly different samples using different testing protocols. This cautiously suggests that study findings on cognitive functioning and symptoms could be generalized. For research purposes, conjoint use of pooled populations for outcome evaluation could be explored with different samples from other centers using different instruments.