Abstracts

P07.10.B. PREOPERATIVE BRAIN MAPPING USING TRANSCRANIAL MAGNETIC STIMULATION APPLIED TO BRAIN TUMOUR RESECTION SURGERY


BACKGROUND: Brain oncological surgery must pursue maximal tumour resection to achieve oncological benefits while preserving acceptable neurological function. Neuronavigation techniques and brain mapping have been reported over the last decades to intrasurgically assess the exact location of neurological functions and secure their preservation. However, the fact that they cannot offer preoperative information and require in some cases the patient’s collaboration during displasing awake surgeries raise the interest during last years on noninvasive techniques offering preoperative functional information. Navigated transcranial magnetic stimulation (nTMS) is a noninvasive technique able to create small magnetic fields and electrically stimulate brain cortex, emulating the effect obtained by cortical direct electrical stimulation (DES). It is a promising tool for performing preoperative cortical brain mapping. MATERIAL AND METHODS: We performed a uncenter prospective descriptive study including patients diagnosed with intra axial brain tumours neighboring cortical zones apparently implicated in motor and/or language functions who were planned for surgical resection. We performed preoperative nTMS (SoTaXic Neuro navigation system 3.0, EMS, Bologna) in all of them to define the location of these functions. RESULTS: Between November 2020 and December 2021 we included 33 patients (11 men, 7 women) with a mean age of 56.9 years (range 29-71). Location (8 temporal, 6 frontal, 3 parietal and 1 insular) and laterality (12 left, 6 right) of the brain tumours were registered. In all cases, cortical brain motor mapping with nTMS was performed with positive results, obtaining a mean anteroposterior diameter of the motor cortex of 22.75 mm. In 11 cases language mapping was also performed, detecting a total of 40 cortical language positive sites (31 frontal, 9 temporal) in those patient’s left hemispheres. No relevant side effects were reported neither after nTMS performance. Definitive pathological results after surgery revealed high-grade glioma in 13 cases and low-grade glioma in 3. CONCLUSION: nTMS is a recent noninvasive technique that allows the realization of preoperative cortical brain mapping. The information provided by this technique has extreme value to bilateralize and to plan brain tumour resection surgeries, according to functional cortical sites identified. The available literature describes its applications, mainly in localizing motor and language cortices, showing good concordance with intraoperative cortical DES, which is still the gold standard technique for brain mapping. Its integration in the preoperative brain tumour assessment offers important advantages without adding relevant morbidity.

P07.11.A. IMPACT OF AWAKE CRANIOTOMY ON EXTENT-OF-RESECTION PERFORMANCE IN GLIOMA: A RETROSPECTIVE, PROPENSITY-SCORE MATCHED COHORT STUDY

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BACKGROUND: The goal of awake craniotomy is to safely optimize the extent-of-resection in patients with glioma. Lower postoperative tumor volume is associated with better overall survival, emphasizing the importance of optimal surgical resection. Awake craniotomy causes less postoperative neurological deficits than surgery under general anesthesia, however, it is unclear whether awake craniotomy leads to lower postoperative tumor volume compared with general anesthesia in presume lower grade glioma. METHODS: Retrospective, matched cohort study in patients with astrocytoma, IDH-mutant grade 2 and 3, oligodendroglioma, IDH-mutant, and 1p/19q-codeleted grade 2 and 3, and low-grade glioma, IDH-wildtype (subependymoma, pilocytic astrocytoma, IDH-wildtype) who underwent awake craniotomy or under general anesthesia between 2003 and 2021 at Erasmus MC Brain Tumor Center. Pre- and postoperative tumor volumes were measured by semi-automatic 3D MRI-segmentation. First, we performed a multivariate logistic regression to assess which factors predicted selection for awake craniotomy. Thereafter, matching based on propensity score was attempted. Outcome variables were postoperative tumor volume, resection percentage and Karnofsky Performance Status (KPS) 3 months after surgery. RESULTS: We identified 181 awake craniotomy-patients and 135 general anesthesia-patients. Awake craniotomy-patients were in better condition, more often male, with tumors more often in eloquent areas, in the left side of the brain and non-contrast enhancing. When performing matching without replacement, only 68 awake craniotomy-patients could be matched with 68 general anesthesia-patients, underlining the imbalance in the dataset. Matching with replacement yielded a matched dataset of 181 awake craniotomy-patients with 60 general anesthesia-patients with adequate matching on most baseline variables, except for eloquent area (47% for awake craniotomy and 21.7% for general anesthesia, p < 0.001). In this matched dataset, median postoperative volume in awake craniotomy was 5.8 mL (IQR 0 - 92.8) vs 12.2 mL (IQR 0 - 90.1) in general anesthesia (p = 0.114). Resection percentage and KPS scores at 3 months after surgery did not differ between awake craniotomy and general anesthesia (p = 0.13). CONCLUSION: Postoperative tumor volume was not lower in awake craniotomy-patients than in general anesthesia-patients were resection percentage and KPS scores at 3 months after surgery significantly different between the groups. Adequate matching was only obtainable using replacement, underscoring the risk of bias in unmatched datasets. These data should be interpreted with care, given the retrospective nature, potential for residual confounding and potential lack of generalizability due to unmatched normal resection patients.

P07.12.B. BRAIN BIOPSY WITH OPTICAL GUIDANCE

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BACKGROUND: Accurate stereotactic biopsies of brain tumors are imperative for diagnosis and decisions on therapy. Repetitive needle insertions owing to inconclusive tissue samples enhance increased risks of brain lesioning, hemorrhage and prolonged procedure. Previously we reported on frame-based stereotactic biopsies with a combined 5-ALA fluorescence and laser Doppler flowmetry detection system[1]. The system has now been adapted to a frameless biopsies with a modified biopsy needle and a awake registration system[2]. MATERIAL AND METHODS: Planning was effected with the Medtronic Stealth System. The optical probe was inserted inside the outer cannula of the biopsy needle, which had an opening at the tip for optical measurements. The probe was manually forwarding it along the trajectory to the target. Fluorescence spectra, microvascular blood flow, and tissue grayness were recorded during insertion. The biopsies were taken where the fluorescence indicated tumor tissue; the optical probe was replaced by the inner cannula. The diagnoses were compared with the fluorescence signals. RESULTS: In the 9 examined patients the fluorescence measurements and pathological diagnosis of high-grade gliomas or lymphomas matched. Only one needle insertion was performed. The optical combined fluorescent and laser Doppler flowmetry measurements took 5-10 min to the target, the pathological diagnosis was reported after 30-70 min. The probe provided direct feedback of increased blood flow along the trajectory and of malignant tissue in the vicinity of the target. CONCLUSION: The optical probe can detect tumor before any tissue is retrieved. If fluorescence is registered, pathological tissue is safely identified. The method can increase the precision and safety of the biopsy and shorten the procedure. The new multimodal probe and the improved registration unit will be tested with other stereotactic and navigation systems and at other neurosurgical centers. Also, the parallel project on fluorescence guided resection of high-grade gliomas is continued[3]. REFERENCES: [1] Johan Richter, Neda Haj-Hosseini, Peter Milos, Martin Hallbeck, Karin Wärdell, (2021), Optical Brain Biopsy with a Fluorescence and Vessel Tracing Probe, Operative Neurosurgery, 217-224, 21(4) [2] Elisabeth Klint, Stina Mauritzon, Bengt Ragnemalm, Johan Richter, Karin Wärdell, (2021), FluorRa - a System for Combined Fluorescence and Microcirculation Measurements in Brain Tumor Surgery, Annual International Conference of the IEEE , 1512-1515 [3] Johan Richter, Neda Haj-Hosseini, Martin Hallbeck, Karin Wärdell, (2017), Combination of hand-held probe and microscopy for fluorescence guided surgery in the brain tumor marginal zone, Photodiagnose and Photo-therapy, 184-192, 18