astrocytomas, we suggest treatments that are more intensive will be needed for the control of these tumors.

Key words: awake brain mapping | lower-grade gliomas | progression-free survival

STMO-7

USEFULNESS OF NU-KNIT IN RETRACTORLESS SURGERY FOR MALIGNANT GLIOMA

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On the removal of the brain tumor, securing of appropriate working corridor and the maintenance of the visibility are one of the most relevant elements regardless of tumor local existence. This is unchangeable extract in these days when a support apparatus such as navigation system and the nerve monitoring was enriched, and, in the malignant glioma that a tumor border is relatively indistinct, the importance does not change either.At our hospital, I protect the access route by two folds of coating of absorbable hemostat(Surgical NU-KNIT) and neurosurgical patties (Delicot) on the removal of the malignant brain tumor in the brain deep part instead without using as possible fixed retractor for the purpose of securing of working corridor under minimum retraction and extract deep part tumor. In this way, normal real protection, wet maintenance, maintenance of the visibility by the control of the bleeding and pressure reduction of the neighborhood organization extracting are provided, and postoperative function recovery gets an early impression. About a method of the securing of working corridor at our hospital, I inspect the usefulness and limit by showing representative cases and want to have an opinion, criticism.

Key words: glioma | retractorless surgery | absorbable hemostat

STMO-9

MAXIMAL SAFE GLIOMA RESECTION USING HIGH RESOLUTION EXOSCOPE

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INTRODUCTION: Maximal safe glioma resection should be achieved using neuronavigation, electrophysiological monitoring, fluorescence visual system, and so on. Heads-up surgery with exoscope is suitable for the multimodal glioma surgery because multi-monitors come in our sights simultaneously. We introduce our glioma surgery using a latest exoscope and neuronavigation system. METHODS: We attempted maximal safe resection for the patients with high grade glioma using 3D/4K exoscope with 5-ALA-induced fluorescence, neuronavigation, and electrophysiological monitoring or awake mapping. An extent of resection, morbidity, and postoperative infarction were retrospectively reviewed. RESULTS: Twenty-one patients (age 26–79, male 11/female 10, glioblastoma 10/lower grade glioma 11, general anesthesia 16/awake craniotomy 5) underwent exoscopic tumor removal. Neuronavigation and electrophysiological monitoring were displayed in sub-monitors close to the main screen. Navigation could be recognized continuously using electromagnetic navigation technology. Intraoperative fluorescence was observed in 100% of the tumor with gadolinium enhancement. Surrounding structures such as white matter, vessels and nerves were clearly visualized under blue light. Supra-total resection or gross total resection was achieved in 8 (80%) of the patients with glioblastoma. Surgical morbidity included hemiparesis in 1 (4.8%) patient, hemianopsia in 1 (4.8%) patient. Postoperative infarction was observed in 2 (9.5%) patients, which was significantly lower compared to 23 of 77 (29.9%) patients with glioblastoma who underwent tumor resection with fluorescence-equipped microscope ($p<0.05$). CONCLUSION: High resolution exoscope surgery is effective for patients undergoing glioma surgery with respect to higher extent of resection and lower ischemic complication. Further studies are needed to assess direct comparisons between exoscope and microscope glioma resection.

Key words: maximal safe resection | exoscope | glioma

STMO-12

EFFORTS FOR SAFE MALIGNANT BRAIN TUMOR SURGERY AT OUR HOSPITAL

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Although maximal safe resection is the current standard for glioblastoma surgery, its safety and removal rate conflict with each other. Electrophysiological monitoring, such as motor evoked potential monitoring and awake craniotomy, can be utilized as safety measures; not all facilities can perform them. Herein, we present a representative case report on our efforts for a safe malignant brain tumor surgery.

Case: A 77-year-old woman with glioblastoma in the premotor cortex presented with seizure of the upper left lower limb. Her pyramidal tract ran from the medial bottom to the posterior of the tumor. We performed excision from the site using the lowest gamma entropy. We then removed all parts of the tumor, with the exception of the pyramidal tract infiltration, and no paralysis was observed. She was definitively diagnosed with glioblastoma and is currently on maintenance chemotherapy.

As a preoperative examination, we performed cerebrovascular angiography. We then performed various other tests to ascertain the patient's condition. Considering lesions that affect language, Wada tests were performed regardless of laterality. For all patients with epilepsy onset, preoperative 256-channel electroencephalogram measurement and intraoperative the gamma entropy analysis were performed to confirm epileptogenicity. Considering lesions that affect eloquence, subdural electrodes were placed and brain function mapping was performed the next day. Based on the results, the safest cortical incision site and excision range were determined, and excision was performed on the following day.

Of the 14 operated glioblastoma cases after November 2018, more than 85% of the contrast-enhanced lesions were completely removed in 7 cases, partially removed in 5 cases, and underwent biopsy in 2 cases. Postoperative Karnofsky performance status scores remained unchanged in 11 cases, improved in 1 case, and deteriorated in 2 cases.

Our efforts have resulted in safe and sufficient removal of malignant brain tumors during surgery.

Key words: Glioblastoma | gamma entropy | maximal safe resection

STMO-14

CLINICAL EXPERIENCE OF BRAIN TUMOR SURGERY USING MIDDLEWARE "OPELINK"

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PURPOSE: The removal of brain tumors requires not only imaging information such as MRI and navigation systems, but also a variety of other information such as neurological function and biological information. To integrate this information, a novel operating room, "Smart Cyber Operating Theater (SCOT)", which connects the medical devices in the operating room via a network has developed. In this SCOT, the intraoperative information is time-synchronized, recorded, and stored by the middleware "OPeLiNK". Clinical experience of brain tumor surgery using OPeLiNK in our institute is reported. **METHODS:** Brain tumor surgeries performed at SCOT, which had been started since July 2018, was enrolled. In all surgeries intraoperative information was integrated by OPeLiNK. Surgical procedure was discussed between main surgeon and supervising surgeon in the Strategy Desk through OPeLiNK intraoperatively, if necessary. Clinical and radiological data from patients who underwent resection at SCOT were analyzed retrospectively. **RESULTS:** Sixty patients were involved. Histopathological diagnosis was glioma in 29 patients, pituitary adenoma in 29 patients, acoustic tumor in 1 patient and intravascular lymphoma in 1 patient. Intraoperative discussion with Strategy Desk through OPeLiNK was useful for not only surgeons but also for medical staff in operation room. Advice for extent of resection and craniotomy from Strategy Desk was conducted by OPeLiNK using conversation and drawing. Intraoperative comment was useful for postoperative review. OPeLiNK, which display multiple intraoperative information, was also used at postoperative conference. **CONCLUSION:** We have reported clinical experience with OPeLiNK for brain tumor surgery in our institute. OPeLiNK was useful for not only sharing intraoperative information with doctors outside the operation room but also postoperative review and education for young doctors.

Key words: brain tumor | middleware | integration

STMO-16

THE USABILITY OF DETAILED PRE-OPERATIVE 3D SIMULATION IMAGE FOR TUMOR RESECTION OF HIGH GRADE GLIOMA

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Introduction: Understanding micro structures is important for the safety and reliable tumor resection for high grade glioma(HGG). The high-resolution 3-demension pre-operative simulation image (3D simulation imege) provides the useful information to the operators. We will report