Primary motor cortex glioma is usually considered unresectable because of its high risk for motor deficit. However, recent reports suggest that surgical resections for primary motor cortex brain tumor is feasible for selected patients. In this case report, we report two cases we can successfully resect primary motor cortex glioma by awake surgery without neurological worsening.

Case 1 was 32-year-old woman with right primary motor cortex oligodendroglioma. We could only perform biopsy at initial surgery, however the patient got mild right hemiparesis which were improved by rehabilitation. The patient underwent 4 courses of PAV chemotherapy and 54 Gy of Intensity Modulated Radiation Therapy (IMRT). 21 months after IMRT, the tumor recurred and she underwent 12 courses of temozolomide chemotherapy, but tumor continued to grow. She underwent second surgery 13 years after the initial biopsy. We resected primary motor cortex tumor by awake motor mapping without severe neurological complication.

Case 2 was 31-year-old woman with left primary motor cortex oligodendroglioma. We could only perform biopsy at initial surgery, however the patient got mild right hemiparesis which were improved by rehabilitation. The patient underwent surgery for 50 Gy of radiation therapy and 6 courses of PCV chemotherapy. 60 months after the initial surgery, the tumor recurred and she underwent 12 courses of temozolomide chemotherapy, but tumor continued to grow. She underwent second surgery 13 years after the initial biopsy. We resected primary motor cortex tumor by awake motor mapping without severe neurological complication.

In conclusion, surgical resections for primary motor cortex glioma is feasible in selected patients without severe neurological complication. Neuronal plasticity is the reason for this, but careful intraoperative awake mapping is necessary to achieve maximum resections.

STOMO-11

CLINICAL EFFICACY OF AWAKE SURGERY: ANALYSIS OF 335 CASES ON EXTENT OF RESECTION AND SURVIVAL TIME
Atsushi Fukui1, Yoshihiro Muragaki1, Takashi Maruyama1, Taichi Saito1, Masayuki Nitta1, Manabu Tamura1, Šyunuke Tuzuki2, Song Ikuta, Takakazu Kazamatam1,1Department of Neurosurgery, Tokyo Women's medical university, Tokyo, Japan

INTRODUCTION: Awake craniotomy (AS) with intraoperative mapping can be compared to obtain maximal resection and preserve neurological function for glioma surgery. However, there is less evidence to improve overall survival for glioma patients. We compared the long-term outcome of glioma resection during AS and general anesthesia (GA). METHODS: Continuous 335 patients with newly diagnosed glioma of WHO grade 2-4 (G2 or higher) who underwent surgery with intraoperative MRI between 2000 and 2013 were reviewed. Three-dimensional volumetric tumor measurements before and after operation were made. Multivariate analysis was used to evaluate the effect of awake surgery on overall survival (OS). RESULTS: The mean age of all cases was 56 years, female: male 1:1.06, mean preoperative tumor volume (PTV) 44.5 cc, mean extent of resection (EOR) 88.3%, and median survival (MST) 80.1 months. The number of cases and the non-Bev group was 6 cases. The number of KPS for the pre-Bev group was (70, 55, 50, 40, 40, 20, 10) and (0, 1, 3, 6, 9, 12, 15) for the non-Bev group. For comparison between the pre-Bev group and the non-Bev group, the extraction rate (%) was T1-Gd (97.6 ± 3.15), MET (95.4 ± 9.99), FLT (0.62 ± 0.03), and for prognosis, median PFS (months) is (10.1, 4.9) and median OS (months) was (17.5, 13.3). CONCLUSIONS: For glioblastoma patients with low KPS at admission, the neoadjuvant Bev therapy improved KPS just before Bev therapy. The neoadjuvant Bev therapy improved and reduced residual volume of MRI and PET examinations and leads to the prolonged prognosis of PFS and OS.

STOMO-18

SUBPIAL RESECTION OF GLIOMA USING CUSA CLARITY
Kuniaki Saito1, Keichi Kobayashi1, Shohei Iijima1, Yoshiaki Matsumoto1, Daisuke Shimaida1, Yoshiaki Shikokawa1, Motoo Nagane1,1Department of Neurosurgery, Kyorin University Faculty of Medicine

BACKGROUND: Maximum safe resection is a primary goal of glioma surgery. Ultrasound-guided tumor debulking is commonly used technique in neurosurgery, as it allows for safe debulking of tumors without damaging the adjacent brain tissue. CUSA Clarity helps to avoid damage to blood vessels and nerve fibers due to its original function, ‘Tissue Select’. Here we introduce glioma surgery using CUSA Clarity. METHODS: We used CUSA Clarity in three cases with glioma at Kyorin University Hospital. According to fragility of the tissues and hardness of the tumor, we adjusted power, irrigation, and Tissue Select level of CUSA Clarity. We also introduce subpial aspiration technique in glioma surgery using normal CUSA. RESULTS: Histological diagnosis of the three patients were WHO grade IV glioblastoma, grade II anaplastic astrocytoma, and grade II oligodendroglioma. All patients underwent successful maximum safe resection without ischemic complication. CUSA Clarity allowed for safe subpial dissection and preservation of pia and dural vessels more perfectly than surgery using normal CUSA. CUSA Clarity also contributed to bloodless dissection of the tumor margin due to
avoidance of feeder injury. When using Tissue Select mode, the power of the CUSA was elevated by 10 or 20 to aspirate the tumor effectively. CONCLUSION: CUSA Clarity contributes to safe resection of glioma due to selective tumor aspiration by Tissue Select.

RADIATION THERAPY (RT)

RT-01
TREATMENT RESULTS OF SALVAGE GAMMA KNIFE STEREOTACTIC RADIONUSSURGERY AND BEVACIZUMAB (AVAGAMMA THERAPY) FOR RECURRENT GLOBLASTOMA

Kenichi Sato1, Masami Takanashi1, Yoshimaru Ozaki1, Taku Asanome1, Hiroonori Sugio1, Yuuki Ishida1, Hirohiko Nakamura2;
1Department of Neurosurgery, Nakamura Memorial Hospital, Brain Tumor Center, Gamma Knife Center

PURPOSE: We report the treatment results of AVAgamma therapy combining gamma knife (GK) and bevacizumab for recurrent glioblastoma.

SUBJECTS: From August 2013 to April 2018, 42 patients (183 lesions) with recurrent glioblastoma treated with AVAgamma therapy as salvage therapy at the time of relapse after initial treatment. The average age is 61.1 years, with 25 men and 17 women. The tumor volume is 100 ml or less in 125 lesions or more as the boundary dose of 20 Gy was performed, and when the irradiation volume was 15 ml or more, a single irradiation boundary dose was divided into two divided irradiations of 12 to 15 Gy. The mean therapeutic borderline dose was 24 Gy. Bevacizumab was administered 10 mg / kg or 15 mg / kg 1 to 10 times after GK. METHODS: Median progression-free survival (mPFS), 6-month progression-free survival (PFS-6m), 6-month survival (OS-6m), median survival (mOS) from treatment with AVAgamma Considered mOS from initial treatment. [Results]: The mPFS from AVAgamma therapy was 5 months, PFS-6m was 37%, OS-6m was 84%, and mOS was 9 months. The mOS from initial treatment were 25 months. In relapsing glioma RPA classification, NABTT CNC class 5 mOS is 5.6 months, class 6 mOS is 6.4 months, but mOS from AVAgamma therapy is 9 months in class 5, 9 months in class 6. The survival time has been extended. DISCUSSION: By AVAgamma therapy, it was thought that recurrent lesions were locally controlled and life prognosis was prolonged. CONCLUSION: AVAgamma therapy is thought to prolong the survival of recurrent glioblastoma and play an important role as salvage treatment.

RT-02
POSSIBILITY OF PROTON BEAM THERAPY FOR THE TREATMENT OF GLOBLASTOMA

Masahide Matsuda1, Eichi Ishikawa1, Masashi Mizumoto, Hidehito Kohzuki1, Narushi Sugì, Akira Matsumura1; Department of Neurosurgery, Faculty of Medicine, University of Tsukuba

INTRODUCTION: Recently, proton beam therapy has attracted increasing interest in the Japanese neuro-oncological field because of the insurance approval for pediatric brain tumor, chordoma, and chondrosarcoma. We have developed the high dose radiotherapeutic strategy using proton beam for malignant glioma in our institution since long before. Here we retrospectively analyzed the efficacy of this treatment strategy. METHODS: Thirty-four patients with newly diagnosed GBM who underwent high dose proton beam therapy were investigated. All patients received hyperfractionated concomitant radiotherapy consisting of X-ray radiotherapy (50.4Gy in 28 fractions) and proton beam therapy (46.2Gy [RBE] in 28 fractions). Concurrent chemotherapy consisted of ACNU in the early 6 cases or TMZ in the late 28 cases. The survival outcome and adverse events were analyzed. RESULTS: The median overall survival time and progression-free survival time for all 34 patients were 35.7 months (95%CI, 28.1–43.4) and 11.2 months (95%CI, 6.8–15.7), respectively. No significant survival difference according to the chemotherapy regimen was shown. Failure patterns after proton beam therapy include 19 cases of local recurrence, 3 cases of distant recurrence, and 5 cases of dissemination. Although there was no significant difference in time to recurrence according to the failure pattern, there was a tendency of longer survival in the local recurrence group. As for adverse events, symptomatic radiation necrosis was observed in 9 cases. The median time to onset of necrosis after radiation was 18.2 months (95%CI, 10.2–26.2). There were 8 cases of long survivors over 3 years out of 34 cases (23.5%). Of these, 6 cases developed symptomatic radiation necrosis. CONCLUSIONS: Our results indicate that high dose proton beam therapy of 96.6Gy (RBE) prolonged survival in selected GBM patients. With appropriate patient selection and potent treatment for radiation necrosis, high dose proton beam therapy has a great potential to improve survival in GBM patients.

RT-03
POSTOPERATIVE CYBERKNIFE HYPOFRACTIONATED RADIOTHERAPY FOR THE ELDERLY PATIENTS WITH GLOBLASTOMA

Yusuke Tabe1, Kengo Sato1, Toshikazu Kimura1, Koreaki Iris1, Shunshue Ichi1; Department of Neurosurgery, Cyberknife Center, Japanese Red Cross Medical Center, Tokyo, Japan

INTRODUCTION: In recent years, hypofractionated radiotherapy (HRT) 40Gy in 15 fractions with concomitant temozolomide(TMZ) has come to be used as standard treatment for elderly glioblastoma. However, the treatment duration of 3–4 weeks for radiation is not enough short, and there is also a problem of radiation sickness. We performed hypofractionated stereotactic radiotherapy with CyberKnife (CK) for less than 2 weeks. We retrospectively analyzed eight newly diagnosed elderly patients with glioblastoma treated by CK. METHODS: Surgical cavity, contrast enhanced lesion, FLAIR high signal intensity area were set as gross tumor volume (GTV). To planned target volume (PTV) as GTV + 2 mm. Median dose (D50) was 5 fractions (Fr) of AVAgamma therapy. The dose prescription and number of fractions were adjusted taking into consideration dose distribution, dose-limiting for important organs such as optic chiasm and brainstem. RESULTS: The eight patients consisted of 3 men and 5 women. The median age was 78 (range 68–84) years old. All patients were pathologically diagnosed as glioblastoma. Two of 8 cases had undergone gross total removal of contrast area. Median postoperative KPS was 70 (40–80). Thirty three (28–33.3) Gy was administered in 3 (3–10) Fr to PTV 117 (44–243) ml. TMZ was used in 7 patients. Bevacizumab (BEV) was used together from 4 weeks after surgery in 5 patients. Progression-free survival was 6.3 (2.9–10.6) months and overall survival was 17.5 (7.1–8.5) months. 7 patients had experienced controllable hypertension with antihypertensive agents, Two patients had suffered from deep vein thrombosis, and anticoagulation therapy was used. One patient had nausea and malaise due to TMZ and had continue BEV alone. Asymptomatic cerebral infarction in the radiation field was observed in a patient. CONCLUSION: CK treated in less than half duration of conventional CRT is expected as less invasive treatment.

RT-05
THE RESULTS OF GAMMA KNIFE RADIONUSSURGERY WITH BEVACIZUMAB (AVAGAMMA THERAPY) FOR RECURRENT GRADE II/III GLOMIA

Taku Asanome1, Kenichi Sato1, Masami Takanashi1, Yoshimaru Ozaki1, Yusuke Kinoshita1, Hironori Sugio1, Yoko Ishida1, Hirohiko Nakamura2; Brain tumor center, the department of neurosurgery, Nakamura memorial hospital, Sapporo, Japan

BACKGROUND: For primary grade II/III glioma, we usually combine radiation therapy and chemotherapy after surgical resection. However, the treatment of recurrent grade II/III glioma is controversial. For lesions that can be safely resected, the second surgical operation may be optimal, but grade II/III glioma often occurs in or near the eloquent areas, so partial resection is often performed. In such cases, if a second surgery for the recurrent tumor is performed, total resection is often difficult. We have performed gamma knife radiosurgery with concurrent bevacizumab (GKRS with Bev) as salvage therapy for recurrent grade II/III gliomas, which were considered difficult to resect. OBJECTIVE: To investigate the outcome of GKRS with Bev for recurrent grade II/III gliomas. METHODS: We retrospectively reviewed initial pathological findings, PFS/OS from GKRS with Bev, and OS from initial treatment for 23 cases receiving GKRS with Bev for recurrent grade II/III gliomas at our institution between August 2013 and March 2019. RESULTS: In the initial pathological findings, grade II were 8 cases (DA: 7, OD: 1), and grade III were 15 cases (AA: 14, AOA: 1). Regarding IDH mutations, in grade II, 3 cases were mutant type, 2 cases were wild type, and 3 cases were unknown. Similarly, in grade III, 5, 6, and 4 cases were mutant type, wild type, and unknown type. Time from GKRS with Bev was median 6 months in grade II and 8 months in grade III, and OS was median 11 months in grade II and 16 months in grade III. From the initial treatment, OS was median 95 months in grade II, and 38 months in grade III. CONCLUSION: Because most of our cases were astrocytic tumors, when they relapsed, it seemed that some of them progressed to glioblastoma. Even in these severe cases, GKRS with Bev can play an important role as salvage therapy.