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ABSTRACT

A case of an intractable clival chordoma against multi-disciplinary treatment.

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Treatment of clival chordomas are still challenging. The tumor tends to recur even with application of various modern treatments. We present a case of a clival chordoma which was intractable against multi-disciplinary treatment.

The case was a 28 year-old man who presented with diplopia since 4 years prior to presentation at our department. Endoscopic endonasal partial resection was performed, but the tumor demonstrated high tendency of regrowth in the short period of time. Thus, transcranial surgery was added, and carbon ion beam radiation therapy was administered. The tumor was indolent for 30.5 months, but demonstrated regrowth thereafter affecting left visual acuity necessitating multiple surgical interventions, which finally led to gradual decrease of the performance status.

The case raised several issues to consider when facing with the intractable chordomas. In the presentation, an attempt will be made to summarize and address those issues.

1. Evaluation of surgical cases of AVM in pre- and post- ARUBA (A Randomized Trial of Unruptured Brain Arteriovenous Malformations) era

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Objective: According to the ARUBA (A Randomized Trial of Unruptured Brain Arteriovenous Malformations) study in 2013, medical treatment has dominancy compare to surgery, stereotactic radiosurgery, or endovascular embolization for unruptured arteriovenous malformation (AVM). After ARUBA, surgery is mainly done for ruptured AVM. We evaluated surgical risk in our institute.

Materials and Methods: From 2008 to 2017, 12 surgically treated AVM cases (9 men and 3 women, age 11-65, mean 26) were retrospectively reviewed. Nidus size varies 15-50mm (mean 27.1), 8 ruptured and 4 unruptured. Spetzler-Martin (S-M) grade was 1-3. In ruptured case, 2 surgery was performed even in eloquent area. Endovascular embolization was performed for 5 cases.

Results: Surgical indication preferred for ruptured AVM or relatively small and low S-M grade for unruptured AVM. Modified Rankin Scale (mRS) was all below 2 during 9-108 months follow up. One major morbidity was occurred on next day after total resection of nidus, so we performed surgical decompression followed by cranioplasty later, and final mRS was 2.

Discussion: That morbidity happened to 5 cm nidus with high flow shunt and deep drainage case. Fragile vessel was thought to be the cause of hemorrhage. Frequent usage of hemoclip may be useful.

Conclusion: We summarized our surgical AVM cases before and after ARUBA trial. Think about hemorrhagic complication of high flow shunt case, medical treatment might be recommended for unruptured AVM.

Key words: Arteriovenous malformation (AVM) : 動静脈奇形

Unruptured : 未破裂

ARUBA (A Randomized Trial of Unruptured Brain Arteriovenous Malformations) trial : ARUBA 試験

Hemorrhagic complication : 出血性合併症

Spetzler-Martin grade : Spetzler-Martin グレード

Stereotactic radiosurgery : 脳定位手術

Endovascular embolization : 血管内塞栓術

2. Prediction of Cerebral Hyperperfusion phenomenon after Carotid Endarterectomy by Transit time Flowmeter

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Purpose: Cerebral hyperperfusion is one of the major complications in carotid endarterectomy (CEA). The purpose of this study is to investigate the relationship between cerebral hyperperfusion phenomenon and internal carotid blood flow measured by transit time flowmeter during operation.

Materials and Methods: We evaluated 74 patients underwent CEA at our hospital. These patients were conducted both measuring blood flow and single photon emission computed tomography (SPECT). Transit time flow volume was measured using the hand-held flow probe system (MediStim, Oslo, Norway). The flow volumes of ICA before and after endarterectomy are recorded as Pre-ICA (ml/min) and Post-ICA (ml/min) respectively. We defined the difference between Post-ICA and Pre-ICA as ΔIC (ml/min). We compared these measurements of hyperperfusion and non-hyperperfusion phenomenon group.

Results: The mean age of the patient was 70.2 ± 7.7 years, and 7 (9.5%) were women. Hyperperfusion phenomenon was observed in 6 patients (8.1%). Pre-operative clinical conditions were symptomatic in all of 6 hyperperfusion phenomenon patients and 33 of 68 (48.5%) non-hyperperfusion phenomenon patients. No significant difference was observed between hyperperfusion phenomenon group and non-hyperperfusion phenomenon group in Pre-ICA and Post-ICA. ΔIC of hyperperfusion group was significantly higher than non-hyperperfusion group (147.0 ± 75.6 and 58.9 ± 62.5 ml/min, $p = 0.004$). The cut off value was 82 ml/min (sensitivity and specificity were 83.3% and 77.9%) and area under the curve value was 0.849.

Conclusion: This study suggested that ΔIC is associated with hyperperfusion phenomenon. Transit time flowmeter is useful to predict hyperperfusion during operation.

Key words: carotid endarterectomy; cerebral blood flow; hyperperfusion (過灌流); hyperperfusion phenomenon (過灌流現象); transit time flowmeter (トランジットタイム血流量計)

3. Occipital artery—anterior cerebral artery bypass with posterior auricular artery—middle cerebral artery bypass for severe stenosis at the internal carotid artery bifurcation: a case report

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Background: Superficial temporal artery (STA) – middle cerebral artery (MCA) bypass and STA – anterior cerebral artery (ACA) bypass is a possible treatment for selected ischemic cases. However, STA is not always available because of the hypoplasty, posttraumatic change, or previous operation. In such cases, other cutaneous arteries can be used as alternative donors to improve cerebral perfusion.

Case presentation: A 59-year-old man complaining of aphasia and paralysis on the right side was transported to our hospital. The symptoms resolved in 90 minutes since the onset. A magnetic resonance imaging demonstrated the stenosis of the left internal carotid artery without any findings of acute infarction. Angiogram confirmed severe left internal carotid artery stenosis and showed delayed perfusion in the left ACA region. Single-photon emission computed tomography revealed poor cerebrovascular reserve capacity categorized as stage two by Powers' classification in the ACA and MCA areas. Dual antiplatelet therapy failed to prevent recurrent transient ischemic attacks of aphasia and weakness of right lower extremity, indicating the need of revascularization in both ACA and MCA areas. As ipsilateral STA was terminated at the bifurcation probably due to previous trauma, we performed occipital artery (OA)—ACA bypass with posterior auricular artery—MCA bypass. Postoperative angiogram showed good patency of both bypasses, and the patient has had no more ischemic attacks.

Conclusions: OA and posterior auricular artery can be alternative donors for cerebral ischemia, when STA is not available. Well-developed OA can also reach ACA.

Key words: internal carotid artery 内頸動脈、anterior cerebral artery (ACA) 前大脳動脈、middle cerebral artery (MCA) 中大脳動脈、superficial temporal artery (STA) 浅側頭動脈、occipital artery (OA) 後頭動脈、posterior auricular artery 後耳介動脈、Powers' classification パワーズ分類、cerebrovascular reserve capacity 脳循環予備能、revascularization 血行再建

4. A case of vertebral artery dissection presenting only headache, which had good recovery through antihypertensive therapy

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Vertebral artery dissection (VAD), especially the one presenting with only headache, has been increasingly diagnosed due to the progress of magnetic resonance image (MRI). Although we have come to recognize that lowering blood pressure (BP) is useful for improving the clinical condition, the practical target of antihypertensive medications has not been systematically studied. We report a recently experienced case of VAD, which had good recovery by lowering the BP below normal level, although there had not been any improvement when the BP was at normal level.

A 45 year-old woman developed left vertebral artery dissecting aneurysm (VADA) with headache. Since her initial BP at the time of arrival was 110's/60's mmHg, we did only pain control with non-steroidal anti-inflammatory drugs (NSAIDs), but not antihypertensive treatment. Her headache persisted and magnetic resonance angiography (MRA) showed the VADA tended to enlarge for nine days. We lowered her systolic BP to between 90's and 100's mmHg with intravenous nicardipine. Symptoms were disappeared two days after the treatment, although MRA showed no changes. Intraluminal hematoma on fat-saturated T1 weighted images gradually improving, she was discharged on the 28th disease day, with her systolic BP lowered to 100's mmHg. She is followed up as an outpatient, and no recurrence has been observed at present. This case suggests that aggressive antihypertensive therapy, even if the initial BP keeps in normal level, is effective to improve not only headache but also dissecting lesions themselves. At the same time, there are concerns that it is enough just to observe.

In this presentation, we will evaluate this case with literature considerations on how much we should lower the BP for patients with VAD.

Key Words: vertebral artery dissection, headache, blood pressure.

椎骨動脈解離、頭痛、降圧療法

5. A case of multiple microbleeds and white matter lesion presenting with a variety of symptoms and cognitive dysfunction

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Introduction: The authors present a case of amyloid angiopathy-related inflammation presenting with rare findings on MR imaging including multiple microbleeds, white matter lesions, and leptomeningeal enhancement.

Case presentation: A 77-year-old man with slowly progressing cognitive dysfunction over the last several months was referred to our hospital for the evaluation of dizziness and difficulty walking lasting for 10 days. MR imaging showed diffuse white matter lesions which were most prominent at the right parietal lobe. Neurological examinations revealed slight disorientation rated as E4V4M6 on the Glasgow Coma Scale without any focal neurological deficits. There were numerous microbleeds around the cerebellum and the cerebral cortex on MR susceptibility-weighted images accompanied with diffuse high intensity areas on MRI T2 weighted images. Gadolinium-enhanced MR imaging showed slight leptomeningeal enhancement in the high convexity regions. These radiological findings were consistent with amyloid angiopathy-related inflammation. He was transferred to the department of neurology of our hospital and received the steroid-pulse treatment. The shrinkage of T2 hyperintensity lesions and the improvement of the cognitive dysfunction were observed after the single treatment session. He had no aggravation of symptoms on the 6 months follow-up.

Conclusions: Amyloid angiopathy-related inflammation demonstrates the distinctive findings on MR imaging characterized by numerous microbleeds, white matter lesions, and leptomeningeal enhancement. Although it is rare, radiological manifestations of this disease should be kept in mind in the treatment of patients with multiple microbleeds, because the steroid administration may successfully reduce symptoms, as the inflammatory mechanism is involved in the development of this condition.

Key words: amyloid angiopathy-related inflammation アミロイドアンギオパチー関連白質脳症, white matter lesion 白質病変, micro bleedings 微小出血, leptomeningeal enhancement 軟膜造影効果

6. Phase I clinical trial of intracerebral transplantation using bone marrow stromal cell (BMSC) against acute ischemic stroke (RAINBOW project)

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Background: Recent breakthrough in cell therapy is expected to reverse the neurological sequelae of stroke. Prior studies have demonstrated that bone marrow stromal cells (BMSCs) have therapeutic potential against stroke, however, there are several problems remain unsolved. In this study, we investigated the use of autologous BMSC transplantation for acute ischemic stroke with several new aspects as a next-generation cell therapy for treating stroke. This study is called the Research on Advanced Intervention using Novel Bone marrOW stem cell (RAINBOW, UNIN ID: UMIN000026130).

Methods/Design: RAINBOW is a phase 1, open-label, uncontrolled, dose-response study, with the primary aim to determine the safety of the autologous BMSC administered to the patients with acute ischemic stroke. Estimated enrollment is 6–10 patients suffering from moderate to severe neurological deficits. Approximately 50 mL of the bone marrow is extracted from the iliac bone of each patient 15 days or later from the onset, and BMSCs are cultured with allogeneic human platelet lysate (PL) as a substitute for fetal calf serum and are labeled with superparamagnetic iron oxide for cell tracking using magnetic resonance imaging (MRI). BMSCs are stereotactically administered around the area of infarction in the subacute phase. Each patient will be administered a dose of 20 or 50 million cells. Neurological scoring, MRI for cell tracking, ¹⁸F-fluorodeoxyglucose positron emission tomography, and ¹²³I-Iomazenil singlephoton emission computed tomography will be performed throughout 1 year after the administration.

Discussion: This is a first-in-human trial to use labelled BMSC to the patients with acute ischemic stroke. We expect that intraparenchymal injection can be a more favorable method for cell delivery to the lesion and improvement of the motor function. Moreover, it is expected that the bio-imaging techniques can clarify the therapeutic mechanisms.

7. Development of a novel device for measuring the contact force of the coils against the aneurysmal wall in an *in vitro* model

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Objective: Recently the endovascular coiling therapy has been remarkably popular for cerebral aneurysms. However, the wall stress in cerebral aneurysms created by the coils is still unknown. We developed a device that can measure the force of the coils against the aneurysmal wall in an *in vitro* cerebral aneurysm model.

Materials and Methods: The device is mainly composed of a microcontroller board, “Arduino”, an analog pressure sensor, and a liquid crystal display(LCD). The sensor is a force sensing resistor that exhibits a decrease in resistance with increase in force applied to the surface of the sensor. The program converts the output voltage to digital data and displays the results on the LCD. We also made a silicone *in vitro* model for a cerebral aneurysm, attached the sensor to the aneurysmal wall, and deployed the coils through a microcatheter. The pressure was shown on the LCD that was recorded consecutively by a camcorder.

Results: The contact pressure was very low up to 0.03 gram at the beginning but showed a sudden increase up to 1.0 gram when the microcatheter was kicked back. We repeated the experiment a couple of times but failed to obtain the statistical data with the technical difficulties.

Conclusion: We observed approximately a sudden 30-fold increase in the contact force when the microcatheter was kicked back during the coil insertion. Although this experiment was primitive, the improvement of the model and the device may help endovascular surgeons select coils preoperatively before the obliteration of unruptured intracranial aneurysms.

Key words: cerebral aneurysm; coiling; contact force measurement; force sensing sensor; device
脳動脈瘤、コイル、接触圧測定、圧センサー、機器

8. Treatment strategy for tiny ruptured cerebral aneurysms: report of three cases

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Background: Endovascular repair for cerebral aneurysm had become a standard practice for cerebral aneurysms. However, endovascular coiling for tiny ruptured aneurysm is technically challenging. On the other hand, direct clipping is usually simple for those small aneurysm because the risk of perforator injury is minimal. Here we report our recent treatment outcome for these tiny ruptured aneurysms to discuss how to determine the treatment strategy.

Case presentation: Case 1: A 39-year-old woman with World Federation of Neurological Societies (WFNS) Grade 1 subarachnoid hemorrhage (SAH). She was at 12th week of gestation. Although her initial MR imaging did not reveal any abnormality, she had another minor leakage on the 8th day. This time MR imaging showed a tiny aneurysm (smaller than 2 mm) at the top of the basilar artery. Since the aneurysm was too small for coiling, clipping was performed without any complication. Case 2: A 82 year-old lady with WFNS Grade 2 SAH had a ruptured distal anterior cerebral artery aneurysm at the left side. Despite its distal location, the course of the parent artery was appropriate the insertion of the microcatheter. Therefore, we chose endovascular surgery to minimize the invasiveness. She had no neurological deficits after coiling and currently continues rehabilitation. Case 3: A 63-year-old woman with WFNS Grade 2 SAH had a 2 mm-sized aneurysm at the bifurcation of the basilar trunk and the superior cerebellar artery. Coiling was expected to be difficult due to the steep angle between the parent artery projection and the parent artery. She was treated by craniotomy and clipping. She was discharged to a rehabilitation facility with no neurological deficit.

Conclusions: Although recent advancement of endovascular surgery has rendered it applicable for most cerebral aneurysms, the feasibility of coiling for extremely small ruptured ones should be carefully assessed especially because clipping is usually a safe and effective alternative for those tiny lesions. In our experience, coiling is technically challenging when the relation of the aneurysm and the parent artery is steep.

Key words: cerebral aneurysm; 脳動脈瘤, clipping; クリッピング術, endovascular surgery; 血管内手術, subarachnoid hemorrhage; くも膜下出血, tiny aneurysm; 極小動脈瘤

9. Mechanical thrombectomy by the Mito Mobile Endovascular Therapy Team: real time performance and efficacy improvement

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Background: The number of endovascular surgeons available for performing mechanical thrombectomy for acute large vessel occlusion is limited. Mito Saiseikai General Hospital accepts patients locally and also from northern Ibaraki. In 2017, the Mobile Endovascular Therapy Team (MET) was created, where an invited neurointerventionalist (mainly from Mito Medical Center Hospital) performs these intravascular procedures. We analyzed the work of this team and ways to improve its efficacy.

Patients and methods: When endovascular treatment is needed, a neurointerventionalist reaches our hospital within approximately 20 minutes while a local team prepares the interventional radiology (IVR) operating room. By this algorithm, 6 patients, including 5 cases with anterior brain vessel involvement and 1 basilar artery occlusion, were treated using stent retrievers. If either the specialist or IVR room are not available, patients are transferred to other specialized hospitals.

Results: Reperfusion was obtained in 4 out of 6 patients. For faster performance a common consent form was created and more team experience will shorten the time from the vessel occlusion till the start of the procedure. Overall, procedures were faster in the “transfer” group, even with patient transportation time. IVR room preparation was a limiting factor for our performance.

Conclusion: Our mobile endovascular team is a crucial solution for providing mechanical thrombectomy in needed areas. Shorter time to reperfusion for better patient outcome can be achieved by improving team work rather than individual doctor skills.

Key words: Mechanical thrombectomy : 急性期血栓回収術、stent retriever : ステンントレトリーバー、Mobile Endovascular Therapy Team、neurointerventionalist: 脳血管内治療専門医

10. Clinical experiences in Toronto

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We neurosurgeons in Japan are so busy with daily works, including surgery, clinic, education, and a pile of paper works that we cannot pay attention to how neurosurgeons in other countries are working. I had an opportunity to work at St. Michael's hospital in Toronto, Canada as a clinical fellow. I found that there were so many different things at St. Michael's Hospital. Although they are as extremely busy as neurosurgeons in Japan, they are working so efficiently to minimize burden. I will discuss the difference between Toronto and Japan in the context of follows;

Volume of patients in the hospital

Residency program

Clinic

On call

Round

Nurse practitioner

Number of neurosurgeon in the country

Key words: Neurosurgery system in Toronto, Round, Clinic, On call, Operating room

11. Efficacy of Photodynamic Therapy using Talaporfin Sodium for Glioblastoma stem cell

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Objective: Recent studies have provided supporting evidence for the existence of Cancer stem cells in Glioblastoma. These stem cells have the self-renewal capacity, chemoresistant and radioresistant. It has already been shown that Photodynamic Therapy (PDT) with the talaporfin sodium (mono-L-asparthyl chlorine e6:NPe6) causes apoptosis in glioblastoma non-stem cell line. To investigate the effect of NPe6-PDT in Glioblastoma stem cell in vitro.

Materials and Methods: The human glioblastoma stem cell line MGG8 was obtained from Massachusetts General Hospital Brain Tumor Research Center. These cells were incubated with NPe6 for 1 hour. Then they were exposed to PDT using semiconductor laser at 635 nm and the light intensity was set at 50mW/cm². They were used for evaluating the cell viability by MTT assay and examined with AnnexinV and Live and Dead[®]. To monitor reactive oxygen species (ROS) generated by NPe6-PDT, the fluorescent product dichlorofluorescein (DCF) was determined by Microplate Absorbance Reader. NPe6 was compared with 5-Amino Levulinic Acid (5-ALA).

Results: The concentration of NPe6 at half maximal inhibitory concentration (IC50) was 30uM at 5J/cm². The population of AnnexinV positive/ Live and Dead[®] negative cell increased at 4 hours after NPe6-PDT. The concentration of 5-ALA at IC50 was 250uM at 5J/cm². ROS induced by NPe6-PDT was strong more than 10 times compared with 5ALA-PDT at 5J/cm².

Conclusion: In Glioblastoma stem cell, NPe6-PDT produced ROS and induced apoptotic cell death.

Key words: Glioblastoma stem cell, Photodynamic Therapy, apoptosis, reactive oxygen species, half maximal inhibitory concentration

神経膠芽腫幹細胞、光線力学療法、アポトーシス、活性酸素、50% 細胞生存率

12. A case of anaplastic glioma in the right frontal lobe indicating a possible malignant transformation

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Background: We treated a patient with a right frontal high grade glioma for which the postoperative integrated diagnosis was difficult to make.

Case presentation: A 50-year-old man had brain MR imagings for his headache, which demonstrated a 5 mm-sized small mass near the right lateral ventricle. Because he had no neurological deficit, this lesion has been conservatively managed. The tentative diagnosis was a cavernous malformation. The lesion showed a slow growth to 10 mm with calcification and edema over the next 10 years for which the conservative therapy was continued. He then suddenly suffered from severe headache. The CT scan and MR imaging revealed a 14 mm mass with intralesional hemorrhage. The craniotomy and resection of the tumor was conducted. The histological diagnosis was not astrocytoma but more like oligodendroglioma although it lacked the classic features such as uniform round nuclei or the honeycomb structure. The results of the molecular diagnosis were as follow; IDH-1/2 wild type, absence of 1p19q codeletion TERT mutated, ATRX nuclear loss negative, and MGMT promotor methylation positive. Under the integrated diagnosis of anaplastic glioma WHO Grade III, we treated him with radiation and temozolomide. However, he had re-operation 6 months after the first surgery because of recurrence. Currently he has been treated with temozolomide and bevacizumab for 8 months after his second surgery.

Conclusions: A recent study reported that anaplastic astrocytomas/gliomas WHO Grade III with only TERT mutation show the similar course of glioblastomas. We believe that this case is very rare because the integrated diagnosis was difficult to make and the lesion had been observed for longer than 10 years in a stable condition before it initiated to take the form of aggressive course.

Key words: integrated diagnosis; 統合診断 ,
TERT mutation; telomerase reverse transcriptase 変異 ,
anaplastic glioma 退形成性神経膠腫

13. Hammock middle cerebral artery and delayed infarction in the lenticulostriate artery after a staged resection of giant insular glioma: A case report

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A 32-year-old right-handed man with a giant insular low-grade glioma with frontal and temporal extension underwent awake craniotomy with an intentional staged surgery strategy. Preoperative radiological images demonstrated a diagonally elevated middle cerebral artery (MCA) by the temporal tumor and the a significantly compressed striatum. With intraoperative subcortical direct electrical stimulation, the resection was finalized in the temporal part of the tumor due to fatigue, loss of concentration, and the semantic paraphasia induced in the temporal stem. The immediate postoperative clinical course was uneventful, and he was discharged on postoperative day 10. However, on postoperative day 20, he suddenly experienced right hemiparesis. Repeated images revealed infarction in the lenticulostriate artery (LSA) area. The previously compressed striatum was then relieved and relocated to its original position in just 20 days, and the M1 segment of the MCA was remarkably downward, in which MCA resembled a hammock. The resection cavity in the middle temporal fossa was totally replaced by the herniated insular tumor. Angiography confirmed the hammock-shaped MCA and significantly stretched LSA, suggesting the combination of freed striatum from the compression and the loss of temporal structure by the tumor resection as the key mechanism of this delayed ischemia in the LSA area.

Keywords: hammock middle cerebral artery, delayed infarction, lenticulostriate artery, ischemia, insular glioma, staged surgery

14. Expression of CD133 as a putative prognostic biomarker to predict intracranial dissemination of primary spinal cord astrocytoma

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Object: Spinal cord astrocytoma with intracranial dissemination carries a poor prognosis. The mechanisms leading to dissemination remain to be elucidated. A stem cell marker, CD133, was reported to predict recurrence patterns in intracranial glioblastoma. We evaluated the significance of CD133 as a putative prognostic biomarker to predict intracranial dissemination in spinal cord astrocytoma.

Materials and methods: This study included 14 consecutive patients with primary spinal cord astrocytoma treated from 1998 to 2014. Six of the patients were women and the patients' ages ranged from 12 to 75 years. Seven and 6 patients underwent open biopsy and partial resection of the tumors, respectively. After confirmation of the histological diagnoses, all patients were treated either with postoperative radiotherapy, chemotherapy, or a combination of both. To identify factors predictive of intracranial dissemination, we analyzed their clinical data including Ki-67 labeling index (LI), and CD133 expression.

Results: Intracranial dissemination was observed in 6 out of 14 patients. All 6 patients died during the follow-up period. Among the 8 patients without intracranial dissemination, 5 survived ($p = 0.02$). Median survival for the patients with intracranial dissemination was 22.7 months. CD133 expression was significantly higher in patients with intracranial dissemination ($p = 0.04$), while other variables did not indicate the dissemination.

Conclusions: The expression of CD133 can be an efficient biomarker to predict intracranial dissemination in spinal cord astrocytoma. Recognition of high CD133 expression in surgical specimens and early detection of intracranial dissemination is important for the clinical management of spinal cord astrocytoma.

Keywords: cancer stem cell; CD133; intracranial dissemination; spinal cord astrocytoma

15. Primary central nervous system lymphoma after long-term high-dose steroid therapy -Two case reports-

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Objective: Primary central nervous system lymphoma (PCNSL) appears with homogeneous and strong contrast enhancement on neuroimaging, but frequently appears with irregular or dominant contrast enhancement on the margin in the immunocompromised state. Here we report two cases of PCNSL which showed ring-shaped contrast enhancement in patients treated with high-dose steroid therapy for a long time.

Cases: Case 1; A 69-year-old woman had taken steroids for 2 years, and presented with worsening restlessness. Neuroimaging demonstrated a space-occupying lesion with ring-shaped contrast enhancement in the left occipito-parietal lobe. The pathological diagnosis was PCNSL with necrosis.

Case 2; A 51-year-old man had taken steroids for 3 years, and suffering headache. Neuroimaging showed a brain tumor with ring-shaped contrast enhancement in the right frontal lobe. Craniotomy was performed and the pathological diagnosis was PCNSL with necrosis.

Discussion: We think that PCNSL in the immunosuppressed state results from disorder in high activity tumor cells escaping immune surveillance mechanism, resulting in relative ischemia in the central part of the tumor and subsequent necrosis, which appears as irregular or dominant contrast enhancement on the margin. Our patients had taken high-dose steroids for a long time, suggesting a similar mechanism, in conjunction with apoptosis of tumor cells caused by steroid therapy, resulting in atypical neuroimaging findings.

Conclusion: PCNSL in immunosuppressed patients can be difficult to differentiate from abscess or other brain tumors, but magnetic resonance spectroscopy, single photon emission computed tomography, and positron emission tomography are useful for the differential diagnosis.

Key Words: primary central nervous system lymphoma (PCNSL) 中枢原発悪性リンパ腫, steroid ステロイド, immunosuppression 免疫抑制, ring-enhancement リング状増強, necrosis 壊死, ischemia 虚血

16. Microsurgery Simulator of Cerebral Aneurysm Clipping with Interactive Cerebral Deformation Featuring a Virtual Arachnoid

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Objective: To develop a virtual reality clipping simulator possessing interactive brain deforming capability closely dependent on arachnoid dissection and apply it to clinical cases.

Materials and Methods: Three-dimensional computer graphics models of cerebral tissue and surrounding structures were extracted from medical images. We developed a new method for modifiable cerebral tissue complex deformation by incorporating a nonmedical image-derived virtual arachnoid/trabecula in a process called multi-tissue integrated interactive deformation (MTIID). MTIID made it possible for cerebral tissue complexes to selectively deform at the site of dissection. Simulations for 8 cases of actual clipping surgery were performed before surgery and evaluated for their usefulness in surgical approach planning.

Results: Preoperatively, each operative field was precisely reproduced and visualized with the virtual brain retraction defined by users. The clear visualization of the optimal approach to treating the aneurysm via an appropriate arachnoid incision was possible with MTIID.

Conclusion: A virtual clipping simulator mainly focusing on supporting tissues and less on physical properties seemed to be useful in the surgical simulation of cerebral aneurysm clipping. To our knowledge, this is the first to report brain deformation based on supporting tissues.

Keywords: Simulator, Virtual reality, Clipping, Aneurysm, Deformation, Arachnoid

17. Computational fluid dynamics (CFD) simulation of cerebrospinal fluid in the ventricular system

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Introduction: Pediatric hydrocephalus is a challenging disease. Recent analysis has found many controversies in the classical theory of cerebrospinal fluid (CSF) flow, and better understanding of its dynamics is desired. Computational flow dynamics (CFD) analysis has been used in cardiovascular field, but little has done on CSF. We aim this study to visualize CSF flow and its effects on the ventricular walls by computer simulation with CFD analysis.

Method: The study was performed for the patients who were diagnosed with children with hydrocephalus and age-matched control. 1 mm slice magnetic resonance images (MRI) were obtained, and image segmentation and reconstruction of 3-dimensional model was achieved by medical imaging software. Flow simulation was performed with CFD software. Velocity, streamline, wall pressure and wall shear-stress (WSS) were calculated and visualized as 3D-color mapping.

Results: Site-specific pressure gradient was observed on both healthy and hydrocephalus ventricle walls, and larger gradient was found in the ventricles with significant dilatation. Surgical simulation of third ventriculostomy was performed on the imaging software, and decrease of wall pressure was confirmed. WSS mapping shows large site specificity in both healthy and pathological ventricles. CSF turbulence was visualized with streamlines.

Discussion: Simulation of CSF flow was successfully performed, and its clinical relevancy was confirmed. Computational simulations of biological phenomenon are done under limited condition in any cases; therefore the results have to be carefully interpreted. However, it also shows certain aspect that may not be able to observe. Addition of more factors will be considered for future studies to increase accuracy.

Key words: CFD analysis (数值流体力学解析), wall shear-stress (壁剪断応力), turbulence (乱流)

18. Usefulness and limitation of non-contrast MRI images for preoperative simulation on microvascular decompression

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Objective: Microvascular decompression (MVD) is a surgery aiming blood vessel transposition. It is a crucial factor for successful MVD to understand microanatomy around root entry or exit zone (REZ) by practical preoperative simulation. Usefulness of fusion images combining MRI, CT angiography and angiography has been reported, but there is a risk of using contrast medium. Therefore, to minimize invasion of preoperative examination, we performed a preoperative simulation on MVD only with non-contrast MRI images, and report usefulness and limitation of this method.

Materials and Methods: Nine consecutive patients who underwent MVD between 2013 and 2017 were included in this study. Contrast interference steady state (CISS) image of REZ and its vicinity was acquired using a 3.0 Tesla MRI, and three-dimensional (3D) reconstruction images were created for preoperative simulation. We examined differences between preoperative simulation and intraoperative findings, and evaluated its usefulness and limitation.

Results: In all 9 patients, non-contrast MRI images alone could describe microstructures larger than approximately 1 mm in diameter in the REZ, and preoperative simulation was satisfactory possible. However, it was difficult to represent the branches and perforators smaller than 0.5 mm, and microstructures which were closely adjacent to each other. And, microanatomical knowledge was essential to distinguish arteries, veins and nerves in preoperative simulation.

Discussion: With non-contrast MRI CISS image alone, it was possible to create 3D reconstructed images on an already installed workstation without additional cost, and to perform preoperative simulation comparable to previous reports by devising imaging conditions.

Conclusion: Preoperative simulation with 3D non-contrast MRI CISS images was useful and consistent with intraoperative findings, but limitation of this method should also be noted for preoperative evaluation.

keywords: microvascular decompression 神経血管減圧術, microanatomy 微小解剖, preoperative simulation 術前シミュレーション, fusion image 融合画像, contrast medium 造影剤, three-dimensional (3D) reconstruction image 三次元再構成イメージ, intraoperative finding 術中所見, non-contrast MRI 単純 MRI

19. Artifacts of adjustable pressure shunt systems, tendency of smaller artifacts in 3.0 T MRI than 1.5 T MRI

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We have already reported that artifacts of proGAV2 shunt systems were smaller in a 3.0 T scanner than a 1.5 T scanner produced by GE Healthcare. In this study, we compared the artifacts newest MRI-resistant shunt systems of four vendors (Aesculap, Codman, Sophysa, and Medtronic) in three different manufactures' 3.0 T and 1.5 T scanners (GE, Siemens, and Philips). Under permission of our institutional ethical committee, two volunteers underwent routine 3.0 T and 1.5 T MR imaging consisting of T1, T2, FLAIR, DWI, and MRA with new models of shunt devices tightly bound on the left temporal scalp. Artifacts were evaluated and compared with all four valves on 3.0 T (Signa Pioneer) and 1.5 T (Twin Speed) MR scanner (GE Healthcare) and two valves on a 3.0 T (Skyra) and 1.5 T (Avanto Dot) MR scanner (Siemens Healthcare), and 3.0 T (Ingenia) and 1.5 T (Prodiva) MR scanner (Philips Healthcare). 3.0 T scanner of GE Healthcare shows smaller artifact areas than those of 1.5 T with all shunt valves on every sequences. And 3.0 T scanner of the other scanner manufacturers also shows smaller artifacts than 1.5 T on DWI, and MRA. It is well known that 3.0 T scanners show larger clip artifacts than 1.5 T. In this study, however, the artifacts of the shunt device containing permanent magnets showed tendency of smaller artifact in the 3.0 T scanner. In cases of acute ischemic stroke, patients with new MRI-resistant shunt systems should be studied with 3.0 T scanner.

Key words: permanent magnets: 永久磁石, FLAIR: fluid-attenuated inversion recovery, DWI: diffusion-weighted imaging, MRA: magnetic resonance angiography

20. In vivo 3D analysis of cervical endplate subchondral bone density distribution

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Objective: Cervical interbody devices have been increasingly used for the treatment of degenerative cervical disc disease. Device subsidence is one of the postoperative complications. Subchondral bone density distribution (SBD) could be a predicting factor of subsidence of the device. There are difficulties to measure SBD distribution on and underneath curved surfaces like cervical endplates. The purpose of this study is to investigate the relationship between the regional strength of the cervical endplate and the cervical endplate SBD distribution measured by a novel 3D SBD measurement method using human cadaveric cervical spines.

Material and Methods: Eight fresh human cadaver cervical spines were used. All specimens underwent CT scans. 3D CT-image data were converted to point-cloud 3D models by using custom-made software program. Density in Hounsfield Units (HU) at each point of the endplate were calculated from 8 adjacent volumes by linear interpolation. We evaluated correlation of the density in HU at each point of indentation test and actual strength of subchondral bone.

Result: There was a significant correlation ($P < 0.001$) between the average endplate strength and the SBD measured with our method on linear regression analysis with $R = 0.57$.

Conclusion: The advantage of our method is that it can measure subchondral bone density distribution streakily. Therefore, we can choose appropriate device for individuals to evaluate subchondral bone density distribution precisely with our method.

Key Words: Cervical endplate, subchondral bone density, device subsidence, indentation test, linear interpolation, load-displacement curve, ultimate strength, Anterior cervical discectomy and fusion, point cloud data, 押し込み試験, 軟骨下骨, 終板

21. A case of laterally-extended high-positioned chordoma treated by high cervical retropharyngeal approach

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Background: Various surgical approaches for the upper cervical vertebrae and the cranio-vertebral junction have been reported, but each has advantages and disadvantages. We perform a surgery with high cervical retropharyngeal approach for a lesion that extended laterally and need spinal fixation. This approach can secure wide and clean operation field. We, here, report usefulness of this approach with illustrative video.

Case report: A 64-year-old woman had numbness and weakness in the right upper extremity. An MRI revealed a tumor in spinal epidural space in the cervical spine. The tumor destroyed the right half of the C3 vertebral body and extended outward the spinal canal. Firstly, we removed dorsal part of the tumor with posterior approach. Subsequently, we removed ventral part of the tumor with the high cervical retropharyngeal approach. A skin incision was made just below the mandible. The C1 anterior arch and the intervertebral foramina of C3 and C4 were confirmed. After complete removal of the tumor, C2-C4 vertebral bodies were reconstructed and fixed with iliac bone and titanium plates. The histological diagnosis was chordoma, and proton beam therapy was performed subsequently. There has been no recurrence for 5 years.

Discussion: High cervical retropharyngeal approach has an advantage in that wide operative field can be obtained. And it is reported that this approach has low risk of infection than transoral approach.

Conclusion: The high cervical retropharyngeal approach is considered to be one of the appropriate approaches to the cranio-vertebral lesions.

Key words: chordoma 脊索腫 ;
cranio-vertebral junction 頭蓋頸椎移行部 ;
high cervical retropharyngeal approach

22. Muscular-stage dissection during far lateral approach and its transcondylar extension

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Purpose: The far lateral approach includes exposure of the C1 transverse process, the vertebral artery, the posterior arch of the atlas, and the occipital condyle. We designed our method of quick muscular stage dissection and present our experience for this approach.

Operative methods: We used a horseshoe scalp flap that was reflected downward and medially. The lateral muscle layers were separated layer to layer to expose suboccipital triangle. The medial muscle layers were separated in the midline and reflected in a single layer. At this stage the midline of C1 process and the foramen magnum was identified. C1 transverse process and the vertebral artery were identified by reflection of the superior oblique muscle. The rectus capitis posterior major muscle was reflected to expose the posterior arch of the atlas. The occipital condyle was separated accordingly.

Results: We recently used this method of muscular dissection in 8 of 14 patients (foramen magnum meningioma 9, hypoglossal schwannoma 3, others 2). It was easy and quick to identify anatomical landmarks for this approach.

Conclusion: Our muscular stage dissection could contribute to safe and effective tumor removal.

Key words: Far lateral, Skull base, Surgical approach, Muscular dissection

23. Intentional two-staged surgery for a large glossopharyngeal schwannoma with intra- and extra-cranial extension- A case report

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Background and Purpose: Surgical removal of large jugular foramen schwannomas with intra and extracranial extension is challenging. It may take a long time to complete. Because only one full-time anesthesiologist engages in our hospital, we have planned two-staged surgery for complex skull base tumors. I report a case in which two-staged surgery was virtually effective for gross total tumor removal.

Case presentation: A 53 years-old male presented with a history of dizziness and a left-side hearing difficulty lasting one year. At first operation, we planned exposure of the high cervical jugular vein, posterior-fossa craniotomy, mastoidectomy, and tumor tissue biopsy for pathological diagnosis. Postoperative CT showed that drilling of the mastoid tip and infralabyrinthine part was incomplete. Two weeks later, he underwent the second operation. Further drilling of the mastoid tip and infralabyrinthine part facilitated gross total removal of the tumor. The tumor was derived from the glossopharyngeal nerve. Although dysphagia and hoarseness complicated postoperatively, he was able to take foods orally 16 days after the second surgery. Facial nerve function was preserved, and the left-side hearing was fully recovered.

Conclusion: During transjugular approach, transposition of the mastoid segment of the facial nerve could provide an excellent surgical corridor but may affect facial nerve function, while incomplete drilling of the skull base may prevent total tumor removal. The two-staged surgery facilitated gross total tumor removal via information of the skull base exposure from CT after the first surgery.

Key words: Jugular foramen, schwannoma, glossopharyngeal nerve, two-staged surgery, mastoidectomy, facial nerve palsy, hoarseness, dysphagia

頸静脈孔、神経鞘腫、舌咽神経、二期の手術、乳様突起削開、顔面神経麻痺、嗄声、嚥下障害

24. Inter-Capsular Resection of Cervical Vagus Nerve Schwannoma -Technical Note-

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Background: Cervical vagus nerve schwannoma is rare and its surgical procedure is controversial. The tumor is in general benign and slowly growing without causing symptoms, and therefore it should be advised to remove the tumor while preserving neural function.

Case Descriptions: Case 1. A 52-year-old otherwise healthy woman was incidentally found to have a tumor in the left cervical region. An MRI disclosed a heterogeneously-enhanced clear-bordered fusiform tumor 50 mm in diameter. The tumor was totally removed with the inter-capsular resection technique proposed by Hashimoto, and she was discharged without neurological deficits. There is no tumor recurrence in 2 years. Case 2. A 69-year-old otherwise healthy woman was incidentally found to have a tumor in the left cervical region. An MRI demonstrated a heterogeneously-enhanced clear-bordered fusiform tumor 30 mm in diameter. The tumor was totally removed with the same technique as in the Case 1, and she left our hospital without neurological deficits. There is no tumor recurrence in half a year.

In both patients, the inter-capsular layer was easily identified, and the total resection was achieved.

Results: In these patients, a histopathology of the layer of the surgical specimen was investigated. It proved that the true tumor capsule layer contained no normal neural fibers, tumor tissues and neural sheath (epineurium and perineurium).

Conclusion: This is the first report, in which the true tumor capsule layer was histopathologically proved. The inter-capsular resection technique is useful for preserving neural function while achieving total tumor removal.

Key words: Cervical vagus nerve schwannoma 頸部迷走神経鞘腫, inter-capsular resection 被膜間摘出術, epineurium 神経上膜, perineurium 神経周膜

25. A Case of Nodular Fasciitis Causing Decreased Visual Acuity

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Introduction: Nodular fasciitis (NF) is a rare non-malignant fibroblastic proliferation, typically found in subcutaneous tissue or superficial fascia. It is often misdiagnosed for malignancy such as fibrosarcoma due to its rapid growth and high cellularity, high mitotic index and infiltrative borders in pathology. NF preferably develop in the upper extremities and trunk; head and neck lesions compose 7-15% of the cases, and periorbital and orbital locations, less than 1%. Here we report a case of NF on the optic canal, diagnosed while investigating a child with decreased vision.

Case report: A 3-year-old girl was referred to our institute with decreased vision in her left eye. MRI revealed a single lesion in the roof of the left optic canal bone with local bony erosion, which compressed the left optic nerve. Differential diagnoses at the time included osteohemangioma, osteoid osteoma, and Langerhans cell histiocytosis. The patient underwent total tumor resection and left optic canal decompression. Histopathology was consistent with nodular fasciitis.

Discussion/ Conclusion: There is only one published report of NF in the periorbital area that caused compressive optic neuropathy. The reported case revealed NF in the orbital apex and subtotal resection was conducted via supraorbital approach. Our case is the first reported case to conduct total resection via subfrontal approach. This approach also enabled decompression of the optic canal by eliminating the optic canal roof. Previous reports suggest that orbital decompression is an effective treatment for compressive optic neuropathy, offering potential improvement in optic nerve function. Compressive optic neuropathy due to NF should be considered as differential diagnosis of decreased unilateral visual acuity in children.

Keywords: nodular fasciitis, visual acuity, sphenoid bone, orbit, total tumor resection, optic canal, optic neuropathy

結節性筋膜炎、視力、蝶形骨、眼窩、腫瘍全摘出術、視神経管、視神経障害

26. Microvascular decompression is effective for oculomotor nerve palsy caused by posterior cerebral artery compression

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Introduction: Oculomotor nerve palsy is often caused by diabetes mellitus and cerebral aneurysm. However, approximately 25% of the cause of oculomotor nerve palsy remains unknown. We report a case of oculomotor nerve palsy caused by compression of posterior cerebral artery (PCA) to discuss operative findings.

Case presentation: A 66-year-old woman suddenly developed diplopia and right ptosis. Her symptoms were compatible to incomplete right oculomotor nerve palsy. Magnetic resonance imaging (MRI) showed right PCA with strong curvature conflicting right oculomotor nerve. We performed microvascular decompression surgery. In operation, the P1 segment of PCA caused indentation to the oculomotor nerve in the prepontine cistern. Transposition of the PCA with prosthesis released the conflict. After the operation, her right ptosis gradually improved. She fully recovered 48 days after operation.

Discussion: Neurovascular compression is famous as the cause of hemifacial spasm, trigeminal neuralgia, and glossopharyngeal neuralgia. On the other hand, there are only few reports that neurovascular compression caused oculomotor nerve palsy. In some cases, causes of the oculomotor nerve palsy has remained undetected. A high index of clinical suspicion can detect vascular compression of the oculomotor nerve and lead to proper surgical management.

Key words: Neurovascular compression syndrome (神経血管圧迫症候群), Oculomotor nerve palsy (動眼神経), Posterior cerebral artery (後大脳動脈), Microvascular decompression (微小血管減圧術)

27. Effectiveness of minimal removal of subdural hematoma in term neonates with intracranial hemorrhage and severe respiratory failure

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Objective: Intracerebral or subdural hemorrhage in term neonates is rare and often asymptomatic. Aggressive surgical removal of intracerebral hematoma is usually not indicated. However, there is no consensus for the management of cases with severe symptoms.

Methods: Three cases of term neonates with severe respiratory failure and intracranial hemorrhage underwent surgical intervention. The etiology of hemorrhage and effectiveness of surgery were discussed.

Results: The mean gestational age was 38 weeks and 2 days. Two cases were delivered virginally and the other was by C-section. Initial symptoms were apnea in two cases and fever in one case, occurring at mean postnatal day 2, all of which progressed to severe respiratory failure. The hematomas of the three cases were located in the right medial temporal lobe, right lateral temporal lobe, and at the left tentorium, respectively. None of the cases revealed to have hematological abnormalities. None of them were associated with delivery by vacuum extraction or forceps, but the cause of bleeding was possibly due to birth trauma. All cases were associated with subdural hematoma. Aggressive removal of intracerebral hematoma was not planned in all cases and only minimal removal of subdural hematoma with small incision was successfully performed to achieve the decompression of brainstem and cerebrum. Respiratory conditions improved after surgery.

Conclusion: Neonatal intracranial hemorrhage is often associated with subdural hematoma. Although the indication of intracranial hematoma removal in neonates is controversial, withdrawing limited amount of subdural hematoma in cases with severe respiratory failure would be effective to bring good outcome.

Key words: Neonate, newborn, term, intracranial hemorrhage, subdual hematoma, birth trauma

28. Predictive factors of elevated intracranial pressure required decompressive craniectomy in moderate to severe traumatic brain injury patients from the Japan Neurotrauma Data Bank (Project 2009)

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Introduction: The key of TBI patients care is controlling ICP. In this study, we've investigated the predictive factors of elevated ICP in moderate to severe TBI patients from the Japan Neurotrauma Data Bank (Project 2009).

Methods: The subjects were 125 patients with an ICP monitor from Project 2009. They were divided into two groups in which maximum ICP ≥ 20 mmHg during the course was "elevated ICP group" and ICP > 20 mmHg was "normal ICP group". Age, mechanism of injury, vital signs and blood gas examination, Glasgow Coma Scale (GCS) score, ISS, head CT findings, initial ICP and clinical outcome were evaluated.

Result: GCS score was significantly lower in the elevated ICP group. ISS and serum glucose level were higher significantly in the elevated ICP group. In the elevated ICP, higher rates of disappearance or compression of the perimesencephalic cistern and severity of midline shift were shown. The elevated ICP group indicated significantly low favorable outcome rate.

Conclusion: Lower GCS score, hyperglycemia, higher severity of midline shift, and perimesencephalic cistern compression might be possible for predictive factors of elevated ICP.

Key words: severe traumatic brain injury (重症頭部外傷), Japn Neurotrauma Data Bank (日本外傷データバンク), Intracranial pressure (頭蓋内), predictive factor (予測因子), Decompressive Craniectomy (減圧開頭術)

29. Treatment of traumatic intracranial hemorrhage in patients with pre-injury dual antiplatelet use: Wait-and-see versus aggressive intervention

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Background: Antiplatelet use for prophylaxis and treatment of stroke and heart disease is increasing. Currently there are no clear guidelines for treatment of traumatic intracranial hemorrhage in patients with pre-injury dual antiplatelet therapy (DAPT).

Objective: The aim of this study was to present two representative cases of traumatic intracranial hemorrhage patients with pre-injury DAPT and review the recent literature.

Cases: A 69-year-old man fell from a height and suffered head and chest injury. Past medical history included ischemic heart disease treated with aspirin and clopidogrel. Initial neurological exam was significant for a mild consciousness disturbance (JCS 1-2R). Admission head CT showed left skull fracture, mild acute subdural hematoma, and mild frontal hemorrhagic parenchymal contusion. Follow-up CT studies showed progressive frontal base hematoma with moderate consciousness disturbance (JCS 20-30). On hospital day three the patient experienced sudden apnea and underwent emergent hematoma evacuation, however subsequently died three days later.

A 66-year-old man with a history of angina treated with aspirin and ticlopidine was struck in the head by a grinding machine. Admission exam showed a mild consciousness disturbance (JCS 1) with a right skull fracture, mild acute subdural hematoma and mild frontal hemorrhagic parenchymal contusion on head CT. Acute follow-up CT showed progressive hemorrhage without worsening consciousness disturbance. He underwent emergent hematoma evacuation, with a good postoperative course.

Conclusion: Patients with traumatic intracranial hemorrhage and pre-injury dual antiplatelet use may benefit from early aggressive surgical intervention. Meticulous intraoperative hemostasis is recommended.

Key Words: dual antiplatelet therapy (DAPT), hemostasis, traumatic intracranial hemorrhage

30. Trapping of recurrent A1 segment dissecting aneurysm after stent assisted coil embolization: case report

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Objective: We present a patient of A1 segment dissecting aneurysm treated with stent-assisted coil embolization followed by trapping.

Case presentation: A 41-year-old woman presented with sudden onset of severe headache. A CT scan revealed subarachnoid hemorrhage, and cerebral angiography demonstrated a right A1 segment dissecting aneurysm. The size of dissected lumen on admission was one centimeter in length and four millimeters in width. First, the endovascular treatment team applied a stent (closed cell stent; enterprise: CODMAN NEURO) to the lesion. However, the aneurysm enlarged three days after, we performed coil embolization. Thereafter, the aneurysm further enlarged during vasospasm period. On the 16th day after the onset, the aneurysm size was five millimeters in width because of coil compaction. On the 21st day, coils and stents were added again, but the aneurysm continued to enlarge. Therefore, A1 trapping using clip was performed. Both end of the stented segment was occluded with Sugita clips. Then, indocyanine green (ICG) video angiogram and intraoperative Doppler ultrasound confirmed the lesion isolated from the circulation. The recurrent artery of Heubner was successfully preserved. She was discharged without neurological deficit.

Conclusions: Endovascular treatment is effective, but there are some remaining issues. In particular, in Japan, it should be strongly notified that there is no insurance indication for intracranial stents for bleeding cases. Therefore, we should not hesitate to perform craniotomy for recurrent dissecting aneurysm after failed intravascular treatment.

KEY WORDS: Subarachnoid hemorrhage, A1 segment dissecting aneurysm, treatment,

くも膜下出血、A1解離性動脈瘤、血管内治療、外科治療、治療選択

31. Mining-guided future prediction-The 20 hottest neuro-oncological fields in 2019

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Background: Grasping objective trends in today's rapidly changing academic fields is important. We analyzed the trends of brain tumor articles with our novel algorithm and predicted the 20 hottest neuro-oncological fields in 2019.

Method: Text-mining analyses were performed to whole MeSH data of all brain tumor articles published in 2017, and to particularly chosen text data of 2017 international conferences. The 69 most frequently occurring keywords were obtained. Besides we registered other 10 important brain tumor names. These 79 keywords comprised the subject fields of our survey. We also chose the 15 highest impact factor (IF) journals among 8014 journals that have published neuro-oncological articles in 2017. Simultaneously, we found 15 journals that had the largest number of published articles in 2017. These 30 journals were the subject journals of our survey. The annual impact (AI) of each year was calculated for each journal and each field (number of articles published in the journal \times IF of the journal). A field's AI index (AII) for the year was the sum total of AIs of each of the 30 journals. The AII trends of the 79 subject fields during 2008–2017 were analyzed with linear approximations. With this algorithm, the 20 hottest neuro-oncological fields in 2019 were predicted.

Results: The 20 predicted fields comprise not only widely recognized fields such as immunological field like PD-1 and epigenetics field, but also emerging fields such as microenvironment. The results of the other fields and details of our algorithm will also be discussed.

Key words: mining マイニング, neuro-oncology 神経腫瘍学, linear approximations 線形近似, epigenetics エピジェネティクス, microenvironment 微小環境