

1-P-1

risk factors of unfavorable outcome and short term outcome in patients with ruptured pericallesal artery aneurysms

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Objective. To assess the short-term outcome and identify risk factors of unfavorable outcome in patients with ruptured pericallesal artery aneurysms (PerAA).

Materials and methods. We analyzed the outcomes of 61 patients with ruptured PerAA, treated microsurgically. Of the patients 39 (64%) were female and 22 (36%) were male, with a mean age of 47 years. Forty four (72.1%) had a single PerAA, and 17 (27.9%) had multiple aneurysms (most commonly middle cerebral artery aneurysms). Hunt-Hess (HH) grade was grade I in 4 patients (6.5%), grade II in 28 (46%), grade III in 23 (38%), and grade IV in 6 (9.5%). Various levels of depression of consciousness were observed in 20 patients (33%). Seven (12%), 13 (21%), 5 (38%), and 36 patients (59%) patients had Fisher scale grades of 1, 2, 3 and 4 respectively. In most cases (70.5%), PerAAs were located on A3 segment, followed by A2 in 28% and A4-A5 in 1.6%. Rebleeding was observed in 9 patients (15%); vasospasm, in 19 (31%). Microsurgical clipping was performed in 52 patients (85%); trapping of the aneurysm in 9 (15%).

Results. Treatment results were assessed by using the Glasgow outcome scale (GOS). At dispatch, 33 (54.1%), 9 (14.7%), 6 (9.9%), and 13 patients (21.3%) had GOS5, GOS4, GOS3, and GOS1, respectively. The statistically significant ($p < 0.05$) risk factors of unfavorable outcome were: HH grades IV-V, Glasgow coma scale score on admission of < 12 , intracerebral hemorrhage of > 20 cm³, rebleeding, vasospasm, and early (first 72h till rupture) operation.

Conclusion: Early operation must be performed in patients without vasospasm and in patients with HH grade I-III. In the patients, who presented with HH grade IV-V on admission, early operation could be performed in selective cases with respect to the identified risk factors due to unfavorable outcomes.

1-P-2

Angiographic risk factors for perforating and parenchymal injury in patients of middle cerebral artery aneurysm clipping with lateral supraorbital approach

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The purpose of this study was to report possible angiographic risk factors that may predict perforating and parenchymal injury during microsurgical clipping of unruptured MCA aneurysm through lateral supraorbital approach.

We conducted a retrospective review of 461 clipping patients of 513 aneurysms during recent 8 years. Aneurysm clipping was performed with MEP and SSEP monitoring. In addition to demographic profiles, angiographic characteristics of aneurysms, which included the side, size, projection, height from the origin of the ophthalmic artery, and distance between the internal carotid artery (ICA) bifurcation and the aneurysm origin, were analysed and correlated with perforator and parenchymal injuries. Any new infarction or contusion in the striatocapsular and frontal area were regarded as perforator and parenchymal injuries even if the extent was relatively small and clinically asymptomatic.

MCA aneurysms were 73(14.2%) in M1, 423(82.4%) in MCA bifurcation and 16(3.1%) in distal MCA. Aneurysm projections were superior in 122(23.7%), inferior in 119(23.1%), anterior in 118(23.0%), posterior 36(7.0%), and lateral 117 (22.8%). The mean distance between the ICA bifurcation and aneurysm origin was 17.13 ± 6.76 mm. The mean height from the origin of the ophthalmic artery was 7.09 ± 3.07 mm. Aneurysm size were < 5 mm in 266(51.8%), ≥ 10 mm in 29(5.6%) and the other in 217(42.3%). Perforator and parenchymal injuries were found in out 29 (5.6%) and 49 (9.6%) of 513 aneurysms, respectively. Although the majority of them remained asymptomatic, neurological deterioration occurred in 6 (1.1%). The distance between the ICA bifurcation and the aneurysm origin was significantly associated with perforator injuries, and height from the origin of the ophthalmic artery was significantly associated with parenchymal injuries.

The shorter distance between ICA bifurcation and the aneurysm origin and longer height from the origin of the ophthalmic artery were significantly associated with perforating and parenchymal injuries. These results will be helpful in predicting the risk of surgical treatment on MCA aneurysm clipping with lateral supraorbital approach.

1-P-3

A case of ruptured right internal carotid-posterior communicating artery aneurysm causing transient mydriasis, conjunctival hyperemia and ophthalmoplegia after clipping

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It is known that blindness as a serious complication after fronto-temporal craniotomy may occur from ocular compression by a skin flap. Oculomotor nerve palsy could be happened as complication due to clipping of internal carotid-posterior communicating artery aneurysm (IC-PC An). We experienced a case that presented transient mydriasis, conjunctival hyperemia and ophthalmoplegia after clipping of ruptured IC-PC An with right fronto-temporal craniotomy and fortunately recovered in a very short time. We report this case and discuss the reasons of these symptoms and preventive maneuver. A 54-year-old woman who developed with a severe headache. 3D-CTA demonstrated right IC-PC An, clipping was performed by right fronto-temporal craniotomy. Aneurysm adhered to uncus and oculomotor nerve. After neck clipping, we peeled off them and confirmed complete clipping. Immediately after surgery, right mydriasis, conjunctival congestion and ophthalmoplegia were presented. Mydriasis and ophthalmoplegia recovered in a few hours. Conjunctival hyperemia also disappeared on the day after surgery. We supposed that the traction force separating aneurysm dome from oculomotor nerve could be slightly too strong. Following skin closure, wrinkles were formed in the flap turning part, there was a possibility that the intraocular pressure was increased by compressing the eyeball with the skin flap.

1-P-4

Preservation of Perforating Arteries in Cerebral Aneurysm Surgery: Clinical Usage of Polyglactin Mesh

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Adequate operative field and preservation of perforating arteries is inevitable for successful safe clipping of cerebral aneurysm. However, it is often difficult to avoid multiple perforators adjacent to or dorsal to aneurysm even if they could be separated from aneurysm. Here we used polyglactin mesh (Vicryl mesh R) for aneurysmal clipping surgery. Polyglactin mesh is made of Glycolic-Lactic Acid Polyester and hydrolyzed within a living body. It is very thin about 0.1mm without any fuzz, and can be cut freely in size and shape. Because of its consistency, it can hold dissected perforators off the aneurysm while clipping the neck, thus facilitating the safe and successful maneuvers. It can also be retrieved safely and easily because it does not adhere to surrounding structures. We used them in 84 cases of aneurysm. We could clip the cerebral aneurysms safely while avoiding perforators, other critical arteries and cranial nerves around aneurysm. No complications like vasospasm and perforator injuries were noted. Eighty-seven percent of clipping was accomplished by junior neurosurgeons under the senior instructors using polyglactin mesh. This procedure is useful and safe in preserving critical arteries and structures like perforators and cranial nerves around cerebral aneurysm.

1-P-5

Usefulness of Preoperative Transfemoral Cerebral Angiography performed before Aneurysmal clipping of distal ACA aneurysms : Determination of unilateral or bilateral interhemispheric approach

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Objective : There are only few reports on management for distal anterior cerebral artery aneurysms (DACA). A unilateral interhemispheric approach and a bilateral interhemispheric approach are representative surgical methods for DACA. However, the surgical decision making to reduce complications after surgery is still difficult and complicated. We report our experience in determining the surgical procedure of DACA.

Materials and methods : We retrospectively reviewed 27 unruptured and 10 ruptured A2 and A3 aneurysm patients who received clipping surgery through bifrontal interhemispheric approach at our institution between January 2013 and July 2017. The mean age of the patients was 57.4 years and the male to female ratio was 1 : 2.27 (11/25). During this period, We performed an unilateral hemispheric approach for patients who underwent TFCA before surgery, after confirming the appearance of venous drainage and determining the approach direction.

Results : Among the total of 43 patients who clipped DACA, Six of them underwent pterional approach, 27 underwent bilateral interhemispheric approach, and 10 underwent unilateral interhemispheric approach. Preoperative TFCA was performed in 24 out of 37 patients, of whom 8 were operated with the unilateral interhemispheric approach (33.3%). Of the 13 patients who had not undergone preoperative TFCA, 2 had undergone surgery with an unilateral interhemispheric approach, and 3 of them were helpful in determining the surgical procedure through intraoperative indocyanine green (ICG) angiography (15.3%). There were no specific complications in both approaches and complete obliteration was possible. However, could preserve more superior sagittal sinus (SSS) in the preoperative TFCA group.

Conclusion : Aneurysms of the distal anterior cerebral arteries are rare and their treatment is still a matter of discussion. The classic bilateral interhemispheric approach to DACA is also a good treatment option, but if there is no large draining vein after TFCA, surgery through the unilateral interhemispheric approach can be a good treatment option.

1-P-6

Surgical Treatment of Carotid Artery Stenosis

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Background and Purpose: We have two surgical methods for the treatment of severe carotid stenosis, although the choice of carotid endarterectomy (CEA) or carotid artery stenting (CAS) has not been established. This report presents appropriate treatment strategy using plaque diagnosis and the clinical results of CEA and CAS.

Materials and Methods: From January 2001 to December 2016, we surgically treated carotid stenosis in 291 lesions by CEA and 335 lesions by CAS. CEA was the first choice for the patients with soft atherosclerotic plaques and severe calcified plaques after plaque diagnosis was made by carotid ultrasonography (carotid US) and black blood magnetic resonance imaging (BB-MRI).

Results: Stenosis of carotid arteries was relieved in all cases after CEA or CAS. Perioperative mortality with CEA and CAS was 0.3% (1/291) and 0.3% (1/335), respectively. Morbidity by ischemic stroke with CEA and CAS was 2.4% (7/291) and 2.0% (5/335), respectively. Surgical morbidity was not high in patients with medical risk factors.

Conclusions: Carotid stenotic lesions can be treated with comparably low morbidity and mortality rates using CEA and/or CAS even with high risks, when appropriate surgical methods are selected considering each characteristic of carotid stenosis using plaque diagnosis.

1-P-7

Microsurgical Carotid Endarterectomy with Interintimal Dissection for Highly Calcified Plaques

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Background: The cases of carotid stenosis with highly calcified plaques show low degree of expansion or intraoperative hypotension by carotid artery stenting (CAS). So, carotid endarterectomy is recommended for highly calcified lesions. But there is a risk of vessel injury to adventitia in carotid endarterectomy for highly calcified plaques. We report our experience of microsurgical endarterectomy for highly calcified plaques and discuss the pathological consideration.

Methods: To obtain complete resection of the plaque with a smooth distal edge and bloodless surface by minimal exposure of the media, the thickened intima is sliced under high-magnification microscopy. We reported this novel technique as "Interintimal dissection" in World Neurosurgery. Usually, the plaques are resected in en-block fashion. But the en-block resection may lead to vessel injury, because the media is very thin in the highly calcified part. So we left behind the highly calcified part intentionally at first and cut off it by piecemeal resection.

Results: One hundred sixty-seven CEAs were performed for 155 patients with carotid stenosis between September 2009 and June 2017. The highly calcified plaques were observed in 46 lesions. Complete resection of plaques without tacking suture was obtained in all procedures. No mortality was encountered. Stroke was recorded in 1 procedures (2.2%). No restenosis was recorded during follow-up (range, 1-82 months; mean, 45.0 months).

Conclusion: Microsurgical interintimal dissection with piecemeal resection for highly calcified plaques could accomplish good surgical outcome, including absence of significant early restenosis and vessel injury.

1-P-8

Results of neck clipping and intraaneurysmal thrombectomy for partially thrombosed giant cerebral aneurysms compressing brainstem.

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Proper surgical treatment for partially thrombosed giant cerebral aneurysms compressing brainstem remain to be elucidated. Between 2011 and 2015, 4 patients with progressive neurological deterioration due to those complex lesions underwent direct neck clipping followed by intraaneurysmal thrombectomy in our institution. Postoperatively, aneurysm size significantly decreased immediately in association with early significant resolution of surrounding brainstem edema. All patients showed neurological improvement after surgery. Our experience introduces this technique as a safe and more durable treatment option for the management of partially thrombosed giant cerebral aneurysms especially in critical locations which needs prompt decompression of vital structures.

1-P-9

Role of bypass procedure for complex cerebral aneurysms

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The treatment of complex cerebral aneurysms such as large/giant aneurysms, dissenting aneurysms, and recurrent aneurysms after endovascular therapy is often challenging. Bypass procedures for the management of complex aneurysms could be treatment options. We retrospectively reviewed the patients with complex aneurysm who underwent bypass surgery between April 2006 and December 2016. The necessity of bypass was determined by balloon occlusion test (BOT) for all the unruptured aneurysms. Ruptured/unruptured aneurysms were 5 cases/21 cases, and high-flow bypass/low-flow bypass were 11 cases/15 cases, respectively. Twenty of 21 patients with unruptured aneurysms showed a favorable outcome (modified Rankin Scale 0-2), while only 1 of 5 patients with ruptured aneurysms had a favorable outcome. In conclusion, the results of our surgical strategy for unruptured complex aneurysms under BOT algorithm were acceptable, however, the results of ruptured complex aneurysms had issues to be solved. To improve the safety of the treatment for complex aneurysms, the bypass procedure is useful and sometimes mandatory.

1-P-10

Usefulness of ultrasound imaging during neurosurgical procedures for patients with vascular malformations

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Purpose: The usefulness of ultrasound imaging during neurosurgical procedures for patients with a cavernous malformation (CM) or cerebral arteriovenous malformation (AVM) was evaluated.

Methods: Thirty-two procedures for 18 CMs (frontal lobe: 3, temporal: 3, occipital: 2, parietal: 2, thalamus: 2, basal ganglia: 1, brainstem: 2, cerebellum: 3) and 14 AVMs (frontal: 5, temporal: 4, occipital: 4, putamen: 1) using intraoperative ultrasound imaging were studied. A two-dimensional (2-D) ultrasound system (Prosound SSD-5500 or α 7 [ALOKA]) linked with a navigation system (SonoNav [Medtronic]) or a 3-D ultrasound system (Voluson 730 Expert or E8 [GE]) was used.

Results: 1) Since the SonoNav system simultaneously showed the same section of the navigation MRI/CT image with the 2-D ultrasound image, the ultrasound image of the oblique section obtained during surgery was easily understood, and intraoperative brain shift was recognized. As CMs or AVMs were observed clearly on B-mode or color Doppler ultrasound images, approach to these lesions was precisely performed. 3-D ultrasound images showing the anatomical relationships between the lesion and surrounding brain structures, such as vessels and ventricles, were obtained using the 3-D ultrasound system as required. Residual lesion and preservation of important vessels were clearly demonstrated. Ultrasound imaging could be performed regardless of the operative position, such as the lateral position. 2) Ultrasound images became obscure in some cases in the late stage of surgery.

Conclusions: 2-D ultrasound imaging by the SonoNav system was useful for precise understanding of the ultrasound images, and 3-D ultrasound imaging demonstrated the anatomical relationships between lesions and surrounding brain tissues as real-time images. These findings facilitated the performance of safe and appropriate surgical procedures for patients with vascular malformations.

1-P-11

Prevalence and risk factors of ataxia after spontaneous cerebellar hemorrhage

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AIM: Cerebellar stroke is usually characterized by the symptom of ataxia. However, no report specifically studied the sequela of motor deficit and the effect of topographic lesion patterns on ataxia following spontaneous cerebellar hemorrhage (SCH). We aimed to determine the prevalence and risk factors determining the severity of ataxia in patients with acute SCH.

METHODS: A total of 58 acute SCH patients were eligible in this multi-center prospective study between January 2015 and September 2016. The demographical, clinical, radiological, laboratory and therapeutic data were recorded. SCH was divided into hematoma in anterior (type 1) or posterior lobe (type 2) or both lobes (type 3). Motor deficit was quantified by the brief ataxia rating scale (BARS) 3 months after the onset of stroke. We defined no or mild ataxia as the score of BARS <7 and obvious ataxia as the score ≥ 7 . Univariate analysis was performed to identify variables related to the obvious ataxia followed by logistic analysis to define the independent risk factors.

RESULTS: There were 16(27.6%) females. SCH was confirmed by CT or MRI. The largest diameter of hematoma ranged from 10 to 60mm (mean: 31mm). 28(48.3%) patients had hematoma larger than 30mm. 21(36.2%), 29(50%), 8(13.8%) patients had SCH belonging to type 1, 2, and 3, respectively. Most patients (72.4%) suffered obvious ataxia while only 2(3.4%) patients were completely free of ataxia. 14 patients received surgery. The median BARS was 11.5[IQR 6, 18]. The following factors were significantly associated with the presence of obvious ataxia: hematoma size, location, admission glucose level, white cell count, neutrophil count, DBP and SBP. Surgical treatment and history of smoke tended to cause significance ($p=0.084$, $p=0.072$). However, only hematoma diameter ≥ 30 mm was identified as independent predictor (OR 8.7, 95%CI 1.2-65.1, $P=0.035$).

CONCLUSIONS: Ataxia is a frequent sequela of acute SCH. Hematoma size is the single most important risk factor determining the occurrence of obvious ataxia. This conclusion implies that the severe ataxia is probably unavoidable for patients with large hematoma, so rehabilitative intervention should be planned in advance and administered timely for these patients.

1-P-12

Current Trend in Diagnosis and Management of Angiographically Occult Vascular Malformation (AOVMs)

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Angiographically occult (or cryptic) vascular malformations (AOVMs) refers to angiographically indemonstrable however intraoperatively visible or pathological positive intracranial vascular malformation lesions. It has an estimated prevalence of 10% of cerebrovascular malformation, 4.5% prevalence in autopsy of spontaneous hemorrhage patients. These data may have changed considering the development in multi-modality neurological imaging over the last 2 decades, this may be a call for a review of cases worldwide and Asia.

AVOMs has been a clinical dilemma as to both diagnosis and treatment. Diagnostically, patients present symptoms like as other ICH patients, making first diagnosis difficult. Low accuracy and specificity in CT scan or MRI alone as well as the lack of efficiency in MRI account for the majority blames for difficulty in radiological diagnosis. Many patients had been misdiagnosed as tumor hemorrhagic stroke, posing a great obstacle in clinical management decision. However, as reported in the literature and coordinating with our own clinical experience, patients are usually present at a relatively early onset age (as reported an averagely age of 28 yrs), with insidious and spontaneous recurrent hemorrhagic symptoms (like H/A) and epilepsy over other symptoms like neurologic deficits in clinical manifestation, and with unmatched symptoms and radiological findings. Also, typical signs in CT scan (hemorrhagic central hyper density and peripheral low density in) plus mixed signal in MRI, advantages of SWI sequence has been discussed to enjoy a higher significance in diagnosis. Thusly, through reviewing literatures combined with our empirical knowledge, a better diagnostic protocol can be proposed. In management, recurrence rate in hemorrhage and epilepsy makes surgery the optimal choice in first line management. But with evidence showing Gamma-knife and X-knife exhibiting positive prospect in previous unideal sites for craniotomy, and neurologic intervention proven not suitable for radiologically insidious findings, a diagnosis-based treatment protocol can also be of help.

Taking all elements like time of diagnosis, locations, volumes of hemorrhage into consideration, we wish this preview can help us decide which measures of management to take when encountering patients.

1-P-13

COMPARISON OF OUTCOME BETWEEN EVACUATIVE DECOMPRESSIVE HEMICRANIECTOMY AND CRANIOTOMY EVACUATION SPONTANEOUS INTRACEREBRAL HEMORRHAGE PATIENTS WITH GLASGOW COMA SCALE < 9

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Indonesian stroke prevalence based upon 2013 Indonesian Health Ministry database that was diagnosed by health professionals was 12.1/mil. West Java was ranked 13 out of 33 provinces with a stroke prevalence of 6.6%. Spontaneous ICH can be really destructive with a high death rate during the first 30 days of onset. Coma patients (GCS < 9) with ICH is a special condition because of the high mortality rate and improper therapy. The aim of this study was to analyze the comparison between evacuative hemicraniectomy decompression and craniotomy evacuation upon spontaneous ICH patients with GCS < 9.

This research was done during February-July 2016. The research used analytical cohort study with comparative analysis design. Employed statistical analysis was unpaired t-test with normal distribution or Mann Whitney if it was abnormal using SPSS ver. 17.

There were 16 samples that met research inclusion criteria. The results of postoperative NIHSS score comparison between decompressive hemicraniectomy and craniotomy showed significant difference with $p = 0.021$ ($p < 0.05$). Meanwhile for postoperative midline shift and less than 30 days mortality didn't demonstrate significant difference with respective were $p = 0.328$ and $p = 1.00$.

Evacuative hemicraniectomy decompression gave better outcome compared with craniotomy evacuation upon spontaneous basal ganglia ICH patients with GCS < 9 using NIHSS score assessment.

1-P-14

1 year survival after decompression craniectomy for severe non-traumatic intracranial hemorrhage

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Background: Decompression craniectomy is a treatment option for intracranial hemorrhage e.g. intracerebral bleeding (ICB) or subarachnoid bleeding (SAB). There is little knowledge of factors predicting outcome after decompression craniectomy for non-traumatic intracranial hemorrhage.

The object of this study was to evaluate the influence of factors for 1 month and 12 month survival after severe non-traumatic intracranial hemorrhage.

Patients and methods: We report on a series of 57 patients who underwent decompression craniectomy for severe non-traumatic intracranial hemorrhage. Follow-up was 1 month and 12 months. All patients underwent decompression craniectomy on the day when intractable increased ICP occurred. Hemorrhages are caused by aneurysms or arteriovenous malformations. We differentiated hemorrhages from those with intraventricular hemorrhages. Also we differentiated clipping/coiling and left/right hemisphere. Potential prognostic factors e.g. gender, age, herniation, smoker, hypertension, diabetes, GCS, WFNS score, pupils, vasospasm, edema, intra cranial pressure and adverse side events, were analyzed.

Results: This data set suggests that young patients benefit from early decompression craniectomy for severe non-traumatic intracranial hemorrhage.

1-P-15

The second phase of Perioperative Antihypertensive Treatment in spontaneous Intracerebral Hemorrhage trial (PATICH 2): a multicenter, randomized, assessor-blinded, controlled study

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Background: The management of perioperative period for patients with spontaneous intracerebral hemorrhage affects the prognosis. Elevated blood pressure is common in the patients with spontaneous intracerebral hemorrhage and related to a poor outcome. Results from the first stage of PATICH confirmed that intensive BP reduction tends to improve functional outcome in surgical sICH patients, but not significantly.

Aims: This study is aimed to compare the prognosis and complications of sICH patients under intensive perioperative antihypertensive treatment and conservative perioperative antihypertensive treatment.

Design: PATICH II is a prospective, multicenter, parallel, randomized, assessor-blinded trial. 714 eligible patients will be assigned to the intensive group and conservative group randomly. Patients allocated to the intensive group will receive an intensive antihypertensive treatment aiming to achieve a target systolic blood pressure of between 120 mm Hg and 140 mm Hg while the patients in the conservative group will receive conservative antihypertensive treatment with target systolic blood pressure of between 140 mmHg and 180 mmHg for 7 days. Operation will be conducted by well-trained surgeons and the best medical treatment will be given in all patients. Patients will be followed up at 7 days, 30 days, and 90 days.

Study outcomes: Primary outcome of this study is the rate of death and dependency at 90 days. Secondary outcomes include rehemorrhage in 7 days after surgery, incidence of ischemic stroke, separate rate of death and dependency at 90 days, health related quality of life (HRQoL) at 90 days, incidence of other vascular events, and days of hospitalization. Dependency is defined by a score of 3–5 based on the modified Rankin Scale (mRS).

1-P-16

Comparison of craniotomy and decompressive craniectomy in large supratentorial intracerebral hemorrhage

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Background and Purpose: Intracerebral hemorrhage (ICH) is devastating disease with high mortality and morbidity rates. Most ICH is evacuated by either craniotomy (CR) or decompressive craniectomy (DC) although optimal treatment has not been established yet. The objective of this study was to compare clinical outcomes of spontaneous ICH patients between CR and DC groups and determine clinical factors affecting clinical prognosis.

Methods: We retrospectively analyzed our single-center experience with large supratentorial ICH. From January 2011 to December 2016, 286 consecutive supratentorial large ICH patients underwent surgery in our institute. We compared CR group and DC group with regard to age, sex, GCS score, hematoma volume, midline shift, ICH score, and time from ictus to surgery. Statistical analysis was done using the t-test or χ^2 test, and odds ratio was calculated.

Results: During study period, CR was performed in 139 patients while DC was performed in 125 patients. There were no significant difference in 30-day mortality between the CR group and the DC group (12.1% vs 13.5%, $p = 0.223$). However, 12-month functional survival was 46.2% in the CR group, which was significantly ($p = 0.014$) higher than that (31.3%) of the DC group. In multivariate analysis, clinical factors affecting 30-day mortality were GCS, hematoma volume, and time from ictus to surgery while factors affecting 12-month functional survival were age, IVH, time from ictus to surgery, and postoperative midline shift.

Conclusion: The 30-day mortality of CR group was not inferior to that of the DC group while its 12-month functional outcome was superior to that of the DC group. Better functional outcome might be obtained for selected patients with CR than with DC.

1-P-17

Paraclinoid wide-neck giant aneurysm clipping with the assistance of EV3 Hyperglide balloon

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Objective: The complex anatomy of the giant paraclinoid internal carotid artery (ICA) makes the surgical management of aneurysms arising from this segment difficult. We reviewed 17 patients (2013-2016) with giant wide-neck paraclinoid aneurysms who were clipped surgically with the assistance of EV3 hyperglide balloon in hybrid OR and discuss the surgical technique, complications, and outcome.

Methods and Result: twenty one giant wide neck aneurysms in the site were totally clipped surgically with the assistance of hyperglide balloon. The Matas test should be completed before the surgery to avoid the ischemia during the temporary occlusion. After the blocking of blood flow, the aneurysm may collapse totally by using of a syringe puncturing. No patient died after surgical treatment. 3 of 23 patients have diplopia. No recurrence of the aneurysm during one year follow-up.

Conclusion: The key features of successful surgical treatment of these lesions include establishing control of the proximal artery, adequate exposure of the aneurysm neck, and successful obliteration of the aneurysm with minimal manipulation of the optic nerve. Accurate preoperative assessment of the origin of these lesions is critical for determining the surgical approach. EV3 hyperglide balloon can block the blood flow totally and seal the wide aneurysm neck accurately during the clipping.

1-P-18

Rapid Re-growing cerebral dissecting A- com. aneurysm despite repeated treatment

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PURPOSE: Four treatments (1st coil embolization, 2nd aneurysmal clipping, 3rd and 4th coil embolization) about repetitive growths of cerebral dissecting A- com. aneurysm performed for 5 months and are being tracked.

MATERIAL AND AETHODS: The present report describes the case of 31-year-old male presented with spontaneous ruptured aneurysm in the anterior cerebral communicating artery manifesting as mental change for several hours. Mental status was stupor and glasgow coma scale was 2-E-3. All extremities motor grade was grade II. Computed tomography (CT) imaging revealed diffuse subarachnoid hemorrhage in the basal cistern sylvian fissure, bilateral cerebral convexity, hydrocephalus, extensive intraventricular hemorrhage. CT-angiography revealed an approximately 8-mm anterior communicating artery aneurysm. Successful coil embolization of aneurysm and external ventricular drainage were performed. One month after the operation, the patient was transfer to department of rehabilitation medicine with confusion mentality. After 10 days, patient give appeal chilling and mild headache. Immediate Brain CT was performed. Computed tomography (CT) imaging revealed developing diffuse subarachnoid hemorrhage in the basal cistern, bilateral sylvian fissure extending to the right cerebral convexity, mild degree of hydrocephalus, comparing to previous examination. Digital subtraction angiography showed a re-growing aneurysm had developed. Re-growing aneurysm size was 1.06cm * 8.5mm. The pterion approach exposed the aneurysm at the anterior communicating artery. The aneurysm was irregular saccular form. The aneurysm was dissected and successful clipped. , the patient was discharge with confusion mentality. After 10 days, patient came to emergency room with drowsy mental status. Immediate Brain CT was performed. Computer tomography imaging revealed acute IVH with ventriculomegaly. Cerebral angiography revealed a regrowing aneurysm that small recanalization of the aneurysm neck with contrast filling. Re-growing aneurysm size was 9.5mm *8.8mm. Successful coil embolization of re-growing aneurysm and ventricular peritoneal shunt were performs. After 2 month, Cerebral angiography revealed a repeated regrowing aneurysm (5.5mm *2.9mm). Repeated coil embolization of re-growing aneurysm was performed.

CONCLUSION: This is the first report of rapid re-growing cerebral aneurysm despite 4 time repeated treatment. Although there is controversy about proper treatment for re-growth dissecting aneurysm, early follow up of cerebral angiography need for detecting re-growing of aneurysm.

1-P-19

Endovascular Treatment for Symptomatic Vertebral Artery Dissecting Aneurysms

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Objective

Vertebral artery dissecting aneurysms (VADAs) are rare and many debates are present about treatment options. We review types and efficacy of our endovascular treatments, and establish a safe endovascular therapeutic strategy regard to the angio-architecture of VADAs.

Methods

Between July 2008 and October 2015, we treated 22 patients with symptomatic VADAs. Fifteen patients presented with subarachnoid hemorrhage from the ruptured VADAs, digital subtraction angiography and magnetic resonance image confirmed the diagnosis and endovascular treatments were followed as their angio-architecture.

Results

Clinical results were good in 13 patients (86.7%), and there were no technical problems during endovascular procedures. The other 2 patients with poor prognosis showed severe neurological deficits at the initial evaluation. Among the three different endovascular strategies, there was no radiologic cure in one patient with stent insertion alone, but the patient had no significant clinical symptoms either.

Conclusions

Endovascular treatments are safe and effective treatment option for managing VADAs and can be the first treatment of choice for most patients. To select proper endovascular strategy according to the angio-architecture of VADAs can reduce the risk of the treatment.

1-P-20

Intraprocedural thrombosis during endovascular treatment of intracranial aneurysms

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Background: Thromboembolic complications are the most common cause of morbidity after endovascular treatment (EVT) of intracranial aneurysms.

Purpose: To review contributing factors, options of treatments, and outcomes of thrombosis during EVT.

Methods: Between 2013 and 2016, 370 intracranial aneurysms underwent EVT at our hospital. We retrospectively reviewed the 19 procedures (5.1%) that had thromboembolic events.

Results: Thromboembolic events more frequently occurred in ruptured aneurysms (18 procedures, 94.7%) and EVT for the anterior communicating artery aneurysm (11 procedures, 57.9%). The location of thrombus was more located the middle cerebral artery (10 procedures, 52.6%). Intraarterial tirofiban was used in 10 procedures (52.6%) and mechanical thrombectomy using stent retriever in 4 procedures (21.1%). TICI 3 or 2b recanalization was obtained in 15 procedures (78.9%). The symptomatic infarction related the thromboembolic events occurred in 6 patients (31.6%).

Conclusions: The EVT for ruptured aneurysms seems to be associated with a significant increase in the rate of thromboembolic events. Although angiographic outcomes after intraarterial thrombolysis or mechanical thrombectomy are favorable, neurologic outcomes are still considerable.

1-P-21

Flow diverter (FRED) treatment of intracranial aneurysms

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Background and objective: FRED (Flow Re-direction Endoluminal Device, Microvention/Terumo) is a second-generation dual layer flow diverting stent for the treatment of intracranial aneurysm. We aimed to review the experience in a regional hospital in Hong Kong under a new antiplatelet alone protocol.

Methods: We retrospectively reviewed all patients with intracranial aneurysms treated with FRED under a new antiplatelet alone protocol in Prince of Wales Hospital in Hong Kong.

Results: Twenty patients with fusiform or saccular aneurysms were included. Four patients had previous coil embolization for ruptured aneurysm with radiological recurrence and two patients had previous Neuroform stent-assisted embolization. Two patients were treated during the acute phase of subarachnoid hemorrhage. All patients were able to have FRED deployed for aneurysm treatment. At 12 months, 77% of aneurysms had complete occlusion and 8% of aneurysm had near complete occlusion. Both of the 2 aneurysms covered with overlapping FRED achieved complete occlusion at 12 months. There were no procedure or post-operative stroke or hemorrhage up to last follow up.

Conclusions: FRED treatment was safe and feasible. The complete occlusion or near complete occlusion were achieved in 85% of aneurysms at 12 months after FRED treatment for intracranial aneurysm. FRED treatment was safe and feasible in all patients in our study.

1-P-22

Clinical Analysis Comparing Efficacy between a Distal Filter Protection Device and Proximal Balloon Occlusion Device during Carotid Artery Stenting

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Objective : The main concern during transfemoral carotid artery stenting (CAS) is preventing cerebral embolus dislodgement. We compared clinical outcomes and intraprocedural embolization rates of CAS using a distal filter protection device or proximal balloon occlusion device.

Methods : From January 2011 to March 2015, a series of 58 patients with symptomatic or asymptomatic internal carotid artery stenosis $\geq 70\%$ were treated with CAS with embolic protection device in single center. All patients underwent post-CAS diffusion-weighted magnetic resonance imaging (DW-MRI) to detect new ischemic lesions. We compared clinical outcomes and postprocedural embolization rates.

Results : CAS was performed in all 61 patients. Distal filter protection success rate was 96.6% (28/29), whose mean age was 70.9 years, and mean stenosis was 81%. Their preprocedural infarction rate was 39% (11/28). Subsequent DW-MRI revealed 96 new ischemic lesions in 71% (20/28) patients. In contrast, the proximal balloon occlusion device success rate was 93.8% (30/32), whose mean age was 68.8 years and mean stenosis was 86%. Preprocedure infarction rate was 47% (14/30). DW-MRI revealed 45 new ischemic lesions in 57% (17/30) patients. Compared with distal filter protection device, proximal balloon occlusion device resulted in fewer ischemic lesions per patient ($p=0.028$). In each group, type of stent during CAS had no significant effect on number of periprocedural embolisms. Only 2 neurologic events occurred in the successfully treated patients (one from each group).

Conclusion : Transfemoral CAS with proximal balloon occlusion device achieves good results. Compared with distal filter protection, proximal balloon occlusion might be more effective in reducing cerebral embolism during CAS.

1-P-23

Spontaneous resolution of traumatic carotid-cavernous fistula

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Introduction

Traumatic carotid-cavernous fistula (TCCF) is an abnormal communication between the cavernous part of internal carotid artery (ICA) caused mostly by high energy trauma. Most of direct TCCF are treated by endovascular embolization because healing process are rarely happened.

Methods

We report our TCCF case. A 16-year-old male presented with protrusion and redness of his left eye, and swishing sound for the last 6 months. One year prior, the patient had history of head injury due to motorcycle accident. He had visited several doctors before he was referred to neurosurgery clinic. On examination, conjunctival and ciliary injection of left eye with proptosis was found. Bruit was audible in left frontal and orbital region. No ophthalmoparesis was found. Four vessel cerebral angiography revealed left side direct CCF with dilated tortuous superior ophthalmic vein filled completely on early arterial phase. Six-month follow-up, there was no clinical improvement on clinical examination. Four vessel cerebral angiography revealed left side direct CCF with dilated tortuous superior ophthalmic vein with filled completely on late arterial phase. Balloon embolization was planned in one month. The patient was advised to perform manual compression his left carotid artery using his right hand 10 times as per tolerance, while waiting for definitive balloon embolization.

Results

During this period, the proptosis and redness of his left eye were improved gradually. Neither orbital bruit nor orbital movement pain was found. We performed cerebral. The cerebral angiogram revealed complete resolution of TCCF. Neither venous contrast filling nor dilated superior ophthalmic vein during arterial phase.

Conclusions

Spontaneous resolution of direct TCCF may happened although it is rare. Conservative management by manual carotid compression for decreasing the flow through the fistula may have a role in TCCF resolution.

Keywords: balloon embolization, Barrow classification, direct traumatic carotid cavernous fistula, spontaneous resolution

1-P-24

Primary hemorrhagic neurovascular diseases (PHNVDs) in Tibetans

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Background: Although there have been many studies on primary hemorrhagic neurovascular diseases (PHNVDs) in different populations, a study focusing on PHNVDs in Tibetan people was still lacking. This study aimed to explore the notable characteristics of Tibetan PHNVDs by comparing the most three common PHNVDs (aneurysmal subarachnoid hemorrhage, spontaneous intracerebral hemorrhage and arteriovenous malformation) in our institution between Tibetan and Han patients.

Methods: In this retrospective observational study, the hospital information system (HIS) was utilized to access the records of patients with PHNVDs. A total of 249 Tibetan patients and 2,093 corresponding contemporary Han patients were recruited from January 2012 to January 2016. Sociodemographic information and clinical data on each PHNVD subtype were collected and compared between two races.

Results: For Tibetan patients, significantly higher incidence ($p < 0.05$) of rebleeding and cerebral infarction was observed in all three PHNVD subtypes. In aneurysmal subarachnoid hemorrhage group, Tibetan patients had significantly higher incidence of blood blister-like aneurysms (BLAs) (19.6% (19/97) vs 3.2% (34/1071), $p < 0.001$). In spontaneous intracerebral hemorrhage group, Tibetan patients got a significantly higher incidence of brainstem hemorrhage in subtentorial area (10.8% vs 5.1%, $p = 0.035$).

Conclusions: For Tibetan PHNVDs, a high incidence of BLAs in aSAH, a tendency toward brainstem hemorrhage in subtentorial sICH, and a high rate of infarction and rebleeding in all three subtypes were all recognized.

1-P-25

Glioma apoplexy presenting like an acute Hypertensive Intracerebral Hemorrhage : A Case Report

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As a neurosurgeon who worked in a developing countries, advanced neuroimaging was far from our reach and clinical judgement is something that we can rely on, but sometimes lack of diagnostic armamentarium makes us difficult to make an accurate diagnosis, although operative decision in an emergency fashion can be made relying on clinical judgment and simple CT scan only.

We report a case of Glioma apoplexy that diagnosed with Hypertensive Intracerebral Hemorrhage preoperatively. Soon we treat the patient with apoplexy protocol and the patient discharged with good follow up.

This case suggest that sometimes a cerebrovascular event could be misdiagnosed but not necessarily mistreated. We emphasize the use of clinical judgement in making a life saving decision, and the problem we are facing in a daily basis especially while treating patient with cerebrovascular event.

1-P-26

Intracerebral Hemorrhage with Cerebral Venous Sinus Thrombosis in Tibetan Population

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Background: Tibetan people have high risk of intracerebral hemorrhage (ICH) as cerebral venous sinus thrombosis (CVST) can be found in some Tibetan ICH patients. However, the risk factors of CVST in Tibetans are unclear. Management and clinical outcome of ICH with CVST in Tibetan patients is still poorly understood. The main objective of this study is to describe and discuss the risk factors, clinical characteristics, treatment and clinical outcome in Tibetan patients of ICH with CVST.

Methods: The retrospective study was performed in the department of neurosurgery in West China Hospital, Sichuan University from January 2005 to January 2015. All radiologically diagnosed cases of ICH with CVST were included.

Results: From January 2005 to January 2015, there were 8579 ICH patients in total in our department, of which 821 patients are from Tibetan population. A total of 39 patients of ICH with CVST were enrolled, including 18 Tibetan patients. ICH with CVST accounted for 2.19% in Tibetan ICH patients. Red blood cell (RBC) count ($P=0.029$) and hemoglobin (HGB) ($P<0.001$) were significantly higher in Tibetan patients. One week after decompressive craniectomy, the mean Glasgow Coma Scale (GCS) score was 5.40 ± 2.27 in all patients and 4.75 ± 2.06 in Tibetan patients. The mean 6-month modified Rankin Scale (mRS) score was 2.05 ± 1.96 in Han population and 2.46 ± 2.30 in Tibetan population ($P=0.592$).

Conclusions: ICH with CVST is more frequent in Tibetan population. The levels of RBC and HGB are significantly higher in Tibetan patients. Although the postoperative GCS is lower, the decompressive craniectomy can improve GCS in Tibetan patients. The 6-month mRS score tends to be higher in Tibetan patients. It is still uncertain if Tibetan patients of ICH with CVST have poorer clinical outcome.

1-P-27

Nano-deferoxamine micelle target the focus of intracerebral hemorrhage to improve iron overload-related brain injury in a mouse model

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Intracerebral hemorrhage (ICH) is a subtype of stroke that is associated with high morbidity and mortality. Evidence has shown that iron overload resulting from the degradation products of erythrocytes is the key contributor of ICH-induced secondary brain injury. Thus iron has been considered to be a therapeutic target for ICH. Deferoxamine (DFO), an iron chelator, has been extensively used in clinical practice for more than 30 years to remove excessive iron from the body, and it has been shown DFO provides some benefit in animal studies of ICH, which bridges it to clinical phase I and II trials. However, the use of DFO was significantly hindered by its drawbacks during the past decades. For example, it has a very short plasma half-life within 30 min in vivo, resulting from its rapid metabolism by the globulin in the blood, thus requiring administration by intravenous or subcutaneous infusion over 8–12 h per day, 5–7 days per week which results in very poor patient compliance. Moreover, some complications such as growth retardation, endocrine dysfunction, cardiomyopathy, and peripheral neuropathies are usually associated with the toxicity of DFO.

Herein, we prepared a novel nano-deferoxamine micelle composed of DFO and Pluronic F127 which has been approved by FDA (Food and Drug Administration of USA) for use as food additives and pharmaceutical ingredients and evaluated its efficient in improving brain injury in a mouse ICH model. The results showed that: (1) the nano-deferoxamine micelle can target the focus of ICH due to long circulation and BBB disruption; (2) administration of low dose of nano-deferoxamine micelle can reduce iron accumulation, decrease neuronal death, and improve neurological function outcome. Taken together, nano-deferoxamine micelle may be potential therapeutic agents for ICH.

1-P-28

Challenge in starting an endovascular centre in a developing country

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Endovascular in neurosurgery will significantly increase the quality of care, thus having an appropriate endovascular equipment in a neurosurgical centre is essential nowadays. But in some places where upgrading healthcare facility is limited either by policy or financial factor, doing so will give challenge to the surgeon, so a good management and treatment planning is needed to sustain an effective endovascular team.

In our centre, limitation mostly caused by financial problem especially when government provided healthcare insurance is not sufficient. For example we often unable to provide enough coil for one procedure, also, stent and flow diverter is something that hard to reach. In this paper, we discuss in details per case management strategy based on the armamentarium and all limitation that we encounter in our center. We also give explanation about our future plans and recommendation.

Establishing an endovascular centre is a big challenge that can be faced with careful management and care planning.

1-P-29

Intracranial Cavernomas – Management strategies

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INTRODUCTION -

Intracranial cavernomas are rare vascular malformations accounting for 0.4% to 0.8% of all intracranial lesions. They usually present with seizures and neurological deficits following hemorrhagic episode. Surgical excision can provide lifetime cure from these lesions.

AIMS AND OBJECTIVES -

To study the clinicopathological profile and discuss management strategies affecting the outcome of patients with intracranial cavernomas.

MATERIALS AND METHODS -

We have studied 38 patients of intracranial cavernomas operated in our department in last 5 years. MRI brain was used as diagnostic modality of choice. Patients' clinical status upon admission and accessibility of the lesion were taken into account for surgical planning.

OBSERVATION AND RESULTS -

Most of the patients were young. 30 patients had single whereas 08 patients had multiple lesions. Patients with supratentorial lesions mainly presented with seizures (75 %) wherein infratentorial lesions had cranial nerve palsies and long tract signs (25 %). Total surgical excision was achieved in all patients. No significant postoperative complications were encountered. None of the patient showed recurrence during follow up period.

CONCLUSION -

Patients benefit from modern neurosurgical techniques in contrast to conservative approach in this disease of rather prolonged and unpredictable natural course.

1-P-30

Transient augmentation of motor evoked potentials during temporary occlusion of middle cerebral artery in aneurysmal surgery: Is it associated with ischemia in subcortical grey matter?

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Objective: To study the clinical characteristics and factors associated with transient augmentation of intraoperative motor evoked potentials (MEPs) during temporary occlusion of the middle cerebral artery (MCA) in aneurysmal surgery. **Methods:** Among 18 patients harboring intracranial aneurysms undergoing direct surgical intervention accompanied by intraoperative MEPs with detailed serial records available while temporarily occluding the MCA, when, how often, and how high the augmentation of MEPs occurred were investigated. The patients were divided into 2 groups, with and without a more than 50% increase of MEPs after application of a temporary clip on the MCA, and parameters related to MEPs were compared to identify factors associated with augmentation of MEPs.

Results: After application of a temporary clip, significant augmentation of MEPs was observed in 8 patients (44%). The ratio of maximum amplitude to control was 2.6 ± 0.9 at an average of 2.3 ± 0.8 min after MCA occlusion. This group did not demonstrate any significant differences in stimulation of control, occlusion time, and minimum amplitude compared to the group without augmentation of MEPs. However, the distance of the temporary clip point from the midline representing the area of blood flow reduction was smaller in the group with augmentation of MEPs than in the group without ($p < 0.05$).

Conclusion: Transient augmentation of MEPs was more frequently observed in cases with a temporary clip applied to the more proximal part of the MCA in aneurysmal surgery.

1-P-31

Elevated hemoglobin is associated with cerebral infarction in Tibetan patients with primary hemorrhagic neurovascular diseases

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Objectives: Although many studies have focused on primary hemorrhagic neurovascular diseases (PHNVs) in different races, studies of PHNVs in the plateau area of China are still insufficient. Chinese Tibetan people are the largest population living in the plateau area. Previous studies have shown that Tibetan PHNV patients have a significantly higher incidence of cerebral infarction, but the mechanism remains uncertain. This study aimed to develop a better understanding on the mechanism of their high risk of cerebral infarction.

Patients and Methods: In this retrospective study, we used a hospital information system to search for consecutive Tibetan patients with PHNVs from January 2012 to June 2016. Intra-hospital data including baseline information and complications were recorded, and the risk factors for cerebral infarction were analyzed.

Results: An elevated hemoglobin (HGB) concentration was positively associated with an increased incidence of cerebral infarction ($P < .001$). The cutoff value that maximized the ability to predict in-hospital infarction in Tibetans with PHNVs was 15.2 g/dL. Tibetan PHNV patients with an increased HGB concentration were more likely to present with cerebral infarction within the first 5 days after onset of PHNVs, and the probability was highest on the 3rd day.

Conclusions: HGB levels could be used to predict in-hospital cerebral infarction in Tibetan patients with PHNVs. These patients are more likely to develop in-hospital infarction when the HGB concentration is higher than 15.2 g/dL. For Tibetan PHNV patients with an elevated HGB concentration, most cerebral infarctions occurred within the first five days after onset, with more incidents occurring on the third day.

1-P-32

Frontotemporal Lobes in Human Severe Traumatic Brain Injury: A Quantitative Protein Profiling Study of Human Brain Samples

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Severe traumatic brain injury (sTBI) is a serious public health issue with high morbidity and mortality rates. Previous proteomic studies on sTBI have mainly focused on human cerebrospinal fluid and serum, as well as on brain protein changes in murine models. However, human proteomic data on sTBI brain is still needed. We used proteomics and bioinformatics strategies to investigate variations in protein expression in human brains after sTBI. Our proteomics data identified 4031 proteins, of which 162 proteins were overexpressed and 5 proteins were downregulated. Also, proteins with binding activity were the most altered in sTBI patients, with the majority of altered proteins showing overexpression. Altered proteins included typical myelin proteins, the main part of the complement family, apolipoproteins, and key players in the blood clotting cascade. The biological pathways that showed significant changes in protein expression according to bioinformatics analysis were glial cell differentiation, complement activation, apolipoprotein catalysis in statin pathway, and the blood coagulation cascade. Western blot verification of protein changes in a subset of the available tissue samples showed results that were consistent with the proteomics data. This study is one of the first to investigate the whole proteome of human sTBI brains, and provides a characteristic signature and overall landscape of the sTBI brain proteome.

1-P-33

Spontaneous Regression of Intracranial Arteriovenous Malformation (AVM)

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Spontaneous regression of intracranial arteriovenous malformations (AVMs) is very rare. The factors responsible for the AVM regression remain unclear. Thrombosis of the AVM secondary to intracranial hemorrhage has been the most commonly associated factor. Other possible causes are the gliosis around the clot secondary to repeated frequent microbleedings or occlusion of the feeding arteries by small emboli. Several factors appear to be associated with spontaneous occlusion: a single draining vein, a solitary arterial feeder, and nidus size smaller than 3 cm. We report a rare case of spontaneous disappearance of intracranial arteriovenous malformation (AVM) with a review of the related literature.

* I prefer poster presentation to oral presentation.

1-P-34

Surgery of cerebral aneurysms in acute stage SAH (experience Moscow high-volume center).

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The management of aneurysmal SAH is complex and distinct from care in other ill population.

Purpose: present study analyzed experience surgery of cerebral aneurysm in acute stage SAH in Moscow high-volume center.

Methods: We reported our surgical experience treatment and clinical outcomes for 3293 patients with ruptured cerebral aneurysms treated in our department between January 1992 and December 2016. All analysis was retrospective and prospective.

Results: Most distal aneurysms were located in the anterior communicating artery (ACoA) – 35,8%, middle cerebral artery (MCA) – 22,5%, internal carotid artery (ICA) – 21%, posterior circulation – 2%, pericallosal artery – 1,3%. Multiple aneurysms were in 17,4%. All patients were managed according to international recommendations including early surgery and aggressive treatment of vasospasm. Nearly 82% patients have preoperative Hunt-Hess Grade – II-III and 70% - massive SAH. More (53,3%) patients operated in 72 hours after ictus. Patients showed good clinical outcome (GOS – 4-5) in 74,3%, suffered permanent neurologic injury (GOS – 3) – 6%, vegetative state (GOS-2) – 1,9% and died (GOS – 1) – 17,8%. The highest percentages of poor outcomes (GOS 1-3) were observed with ACoA aneurysms.

Conclusion: all patients with aneurysmal SAH need to care in high-volume neurosurgical center. Main problem for treatment so patients it's a fight with cerebral vasospasm. Only keep strictly to the today international recommendations for SAH treatment and new experimental works will improve outcome.

1-P-35

Intravenous hydrogen therapy with intra-cisternal magnesium infusion in severe aneurysmal subarachnoid hemorrhage

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Purpose

The failures of recent studies intended to prevent only cerebral vasospasm (CV) have moved the focus of research into delayed cerebral ischemia (DCI) away from only cerebral artery constriction towards other mechanisms such as early brain injury (EBI). We have demonstrated the reversible effect of intra-cisternal infusion of magnesium sulfate solution (Mg), which is potent Ca^{2+} channel blocker, on the delayed angiographic vasospasm (AVS) in the animal experiments. However, the randomized controlled study of the intra-cisternal Mg infusion failed to reduce the incidence of DCI or improve the functional outcome in the patients of SAH (grade 1-4) despite of the significant preventable effect of AVS. Increasing evidence has suggested that enhanced oxidative stress is involved in EBI. Hydrogen (H_2) can reduce hydroxyl radicals and peroxynitrites. Recent experimental studies showed that H_2 can alleviate EBI. In our institution, we also demonstrated that H_2 can be safely administered intravenously in patients with ischemic stroke.

Methods

This study (UMIN 000014696) is a randomized and placebo-controlled design. Patients with high grade (4 and 5) SAH will be randomized to one of three arms: (1) Mg (2.5 mmol/L at 20 mL/h for 14 days) + H_2 (hydrogen-rich fluid, 200 mL twice a day for 14 days) group, (2) Mg group, and (3) control group.

Result and conclusion

Based on basic researches, we have established a combination therapy of H_2 and Mg for the treatment of both EBI and CV. The present clinical trial is designed to investigate the effects of this strategy on the occurrence of CV, DCI, and clinical outcomes after high grade SAH. We will show the theoretical back grounds, the detailed protocol of this combined H_2 and Mg therapy, and the interim results.

1-P-36

Hyperperfusion Syndrome after STA-MCA bypass in Patients with Moyamoya Disease

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Generally, the cerebral autoregulation has been compromised in patients with moyamoya disease. Hyperperfusion syndrome is a major complication for such cases after direct revascularization, which might induce disaster outcomes. Since Oct. 2013, our center have encountered 26 cases with hyperperfusion syndrome after STA-MCA anastomosis. The hyperperfusion syndrome occurred two or three days after surgery. In our serious, one of two patients, who suffered spontaneous ICH, died quickly around 30 minutes after hemorrhage. Various presentation, such as aphasia, paralysis, headache, emotional abnormality and subtle recognize function, was noticed among the other 24 case. In order to differentiate from ischemic syndrome, we adopted multiple modalities, including CTP, MRI, PET-CT et al, to verify exist of the abnormally increased blood supply in the local surgical area. Proper blood pressure control was the most important strategy to deal with such a situation. Edaravone was also a potentially promising medication, which was infused 3 days before and 7-14 days after revascularization surgery in patients with Moyamoya disease. 23 of the other 24 cases with hyperperfusion syndrome had completely relieved 5-14 days later, while one cases suffered ischemic stroke leading transient paralysis and aphasia. In summary, hyperperfusion syndrome was not a rare complication in Moyamoya patients after revascularization surgery with potentially fatal or disaster risk. If could be diagnosed early considerably, hyperperfusion syndrome could have a preferred outcome with narrowly controlled proper blood pressure and Edaravone scavenging oxygen free radicals.

1-P-37

Management of giant paraclinoid aneurysms by methods other than microsurgical clipping

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Background: Giant paraclinoid aneurysms have various features that make such lesions difficult for microsurgical clipping, with high rates of morbidity and mortality. Treatment strategy is still discussed.

Objective: to evaluate the results of treatment of giant paraclinoid aneurysms by methods other than microsurgical clipping at single institution.

Materials: We conducted retrospective review of cases treated between 2008 and 2016 years. Data such as clinical presentation, radiological examination and outcomes were evaluated.

Results: We reviewed records of 24 patients (3 patients were male, 21 female, mean age 52 years) with giant paraclinoid aneurysms. Mean size of the aneurysm dome was 32 mm. 8 aneurysms were managed by endovascular deployment of flow diverter device, in 16 cases we trapped the aneurysm by parent artery occlusion with or without preliminary extra-intracranial bypass. Clinical presentations were headache, cranial nerves palsy and visual disturbances. Follow up period ranged between 6 to 96 months (mean 33 months). Endovascular flow diverter deployment was performed in 8 cases. Trapping the ICA by parent artery ligation or endovascular trapping with coils was done in 9 cases. Preliminary low or high flow extra-intracranial bypass with further ICA trapping was performed in 7 cases. In the group of flow diverter deployment we experienced one fatal complication due to the occlusion of the device and ischemic stroke. Aneurysms occlusion rate was 100%. Neurological symptoms improved in 20 cases (83%). We did not encounter mortality in the group of ICA trapping.

Conclusion: In cases of deployment of flow diverter devices risk of complications is higher in the aneurysms with unfavorable anatomical features of aneurysm, such as wide neck and issues with parent artery. Combined neurosurgical and endovascular approach for giant paraclinoid aneurysms can minimize morbidity and mortality rates. ICA trapping in giant paraclinoid aneurysms is as minimally invasive, less traumatic to brain structures. This procedure have to be evaluated in long term for comparison with direct clipping and flow diverter.

1-P-38

Partial wrap-clipping of the entrance of the pseudolumen of a fusiform aneurysm in the posterior inferior cerebellar artery: a technical note.

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BACKGROUND:

Fusiform aneurysms in the posterior inferior cerebellar artery (PICA) are rare and challenging to treat. Surgical treatment options for a fusiform aneurysm in the PICA include trapping with/without bypass and wrap-clipping, when elimination of the pathological wall from the systemic circulation and prevention of perforator injury are important. In addition, lower cranial nerve impairment due to surgical manipulation should also be avoided.

METHOD:

A fusiform-shaped aneurysm was found in a proximal part of the PICA by magnetic resonance angiography undertaken for evaluation of repeated vertigo in a 36-year-old man. The patient underwent direct surgery via a lateral suboccipital transcondylar fossa approach. The entrance of the pseudolumen was the only part to be wrapped and obstructed by clip application, through the corridor between the acoustic and glossopharyngeal nerves to avoid lower cranial nerve injury.

RESULTS:

Indocyanine green (ICG) videoangiography demonstrated obliteration of pseudolumen and patency of peripheral PICA and perforator contributing to the medulla oblongata. The postoperative course was uneventful without periprocedural complications, including dysphagia and hoarseness.

CONCLUSIONS:

Partial wrap-clipping technique for obstruction of the entrance into a pseudolumen is one of alternatives for dissecting fusiform-shaped aneurysm in the PICA. ICG videoangiography was helpful to confirm the obliteration of the pseudolumen and patency of parent vessel and perforators.

1-P-39

Consideration for surgery of anterior choroidal artery aneurysm

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BACKGROUND: Internal carotid artery-anterior choroidal artery aneurysm (AchA) is not frequent as 2 to 5% of all cerebral aneurysm, but it is reported that complication rate is high due to anterior choroid artery occlusion. We need to be careful with surgical treatment of AchA. **OBJECTIVE AND METHODS:** We consider and report cases with direct surgery to AchA. Subjective were 9 patients with ruptured AchA and 11 unruptured AchA who underwent direct surgery between October 2008 and May 2017 at Shimane Prefectural Central Hospital. We studied patients background, outcome of treatment, angiographical characteristics of AchA and anterior choroidal artery, intraoperative findings, postoperative CT findings. **RESULT:** 1) Six out of 9 cases (66.7%) were good outcome (mRS: 0 to 2) in ruptured cases. (2) There was no infarction of anterior choroid artery area after surgery in ruptured cases and unruptured cases. (3) In the all case of DSA performed, only one anterior choroid plexus artery was visualized, and the imaging ability was higher than that of CTA. (4) Multiple anterior choroidal arteries were identified in 11 out of 20 cases confirmed during surgery. (5) In 2 of 11 unruptured AchA cases, we performed not clipping but coating because the anterior choroid artery originated from dome of the aneurysm. (6) In 2 cases of MEP decline by trial clipping, one case was treated with coating only and another case needed additional coil embolization. **CONCLUSION:** Although DSA exceeds CTA on the evaluation of anterior choroidal arteries, it is still difficult to evaluate the branch of them, therefore intraoperative correspondences are necessary for some situation. Usually, the anterior choroidal artery run on the dorsal side of the aneurysm, so we estimate the track of anterior choroidal artery from the position of the origin and the distal side or one of them, but it is often difficult to presume the track due to multiple branches or adhesion to the aneurysmal wall. To avoid complications, MEP monitor is essential, and for MEP decline on clipping, it is necessary to correspond differently according to whether it is ruptured AchA or unruptured one.

1-P-40

Sonolysis in Prevention of Brain Infarctions during Internal Carotid Endarterectomy (SONOBIRDIE) Trial - an Ongoing Randomized Controlled Trial

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Introduction

Carotid endarterectomy (CEA) is a proven method in primary and secondary prevention of stroke due to internal carotid artery stenosis. Surgical risk of carotid endarterectomy (CEA) varies between 2 and 15%. Transcranial Doppler monitoring (TCD) is commonly used during the procedure to monitor changes in cerebral blood flow and microemboli. Ultrasound beam has been shown to be beneficial in acceleration of thrombus dissolution.

Objectives

The aim of the study is to demonstrate the safety and effectiveness of sonolysis (continual TCD) using a 2-MHz diagnostic probe with maximal diagnostic energy on the reduction of the incidence of stroke, transient ischemic attack (TIA) and brain infarction detected using magnetic resonance imaging (MRI) by the activation of the endogenous fibrinolytic system during CEA.

Patients and Methods

Sonobirdie is an international, multi-center, randomized, double-blind, sham-controlled trial for patients with $\geq 70\%$ carotid stenosis undergoing CEA using computer-generated 1:1 randomization to the sonolysis (SG) or control (sham procedure, CG) group.

Inclusion criteria: patients with symptomatic or asymptomatic carotid stenosis $\geq 70\%$ indicated for CEA, a sufficient temporal bone window for TCD, aged 40-85 years, functionally independent, signed informed consent.

The primary endpoints are the incidence of stroke or TIA during 30 days after the CEA and the incidence of new ischemic lesions on control brain MRI in SG and CG.

Pre-study calculations showed that a minimum of 704 patients in each group (39 end-points) are needed. Descriptive statistics and linear/logistic multiple regression models will be performed.

Results

Totally 468 patients were randomized until June 8, 2017. Interim analysis of 400 patients with completed visit Day 30 demonstrated no adverse event caused by sonolysis, 21 patients (5.3%) had stroke or TIA (6 in SG, 15 in CG), no patient had myocardial infarction, no patient died. Preliminary results of MRI substudy (132 patients) showed new ischemic lesions in 12.1% patients in SG and 18.2% patients in CG.

Conclusion

Sonolysis during CEA is a safe method with promising preliminary results. Further results are awaited and new centers are welcome to join the trial.

Registration

ClinicalTrials.gov NCT02398734.

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1-P-41

Blood blister-like aneurysms in Tibetans: a single center experience

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Object: Although research on blood blister-like aneurysms (BLAs) in different population is well documented, studies of that in the plateau area remain elusive. This study aimed to develop a better understanding of BLAs in Tibetan population, which is a typical representation of people in plateau area.

Methods: In this observational study, the hospital information system (HIS) was used to search for consecutive

patients with BLAs by using the discharge diagnosis. A total of 19 Tibetan patients and 34 Han patients were recruited from January 2012 to January 2016. Intra-hospital and follow-up data were collected and compared between two races.

Results: Compared with Han group, Tibetan group got significantly higher ratio of BLAs among aneurysmal subarachnoid hemorrhages (aSAHs) (19.6% (19/97) vs 3.2% (34/1071), $p < 0.001$), higher Incidence of atypical located BLAs (26.3% vs 2.9%, $p = 0.034$), higher risk of cerebral infarction (63.2% vs 11.8%, $p < 0.001$), and greater number of patients with unfavorable outcomes at 6 months after ictus (57.9% vs 23.5%, $p = 0.028$). In Tibetan group, patients underwent endovascular treatment presented with significantly lower cerebral infarction rate ($p = 0.019$) and better neurological functional recovery outcome ($p = 0.048$) compared with surgical group.

Conclusions: Compared with Han patients, Tibetan BLA patients presented with high risk of occurrence with atypical locations and high incidence of cerebral infarctions with poor prognoses. Endovascular treatment benefits more for

Tibetan BLA patients in reducing cerebral infarctions and improving neuro-logical functional recovery prognosis.

1-P-42

PARP inhibition attenuates early brain injury through NF- κ B/MMP-9 pathway in a rat model of subarachnoid hemorrhage

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Poly (ADP-ribose) polymerases (PARPs) play an important role in a range of neurological disorders, however, the role of PARP in early brain injury after subarachnoid hemorrhage (SAH) remains unclear. This study was designed to explore the role and the potential mechanisms of PARP in early brain injury after SAH. Eighty-nine male SD rats were randomly divided into the Sham group, SAH+Vehicle group and SAH+PARP inhibitor (PJ34) group. An endovascular perforation model was used to induce SAH in rats. PJ34 (10 mg/kg) or vehicle (0.9% NaCl) was intraperitoneally administered at 5 min and 8 h after SAH induction. Mortality, SAH grades, neurological function, Evans blue extravasation, brain edema, immunofluorescence staining and western blotting were performed. PJ34 reduced BBB permeability and brain edema, improved neurological function and attenuated neuronal cell death in the rat model of SAH. Moreover, PJ34 inhibited the nuclear translocation of NF- κ B, decreased the expression of the pro-inflammatory cytokines IL-1 β , IL-6 and TNF- α , reduced the expression of MMP-9, prevented the degradation of tight junction proteins, and decreased microglia activation. These data indicated that PARP inhibition through PJ34 might be an important therapeutic drug for SAH.

1-P-43

Minimally invasive surgery of hypertensive basal ganglia hemorrhage: a clinical and related basic study

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Treatment of hypertensive basal ganglia hemorrhages is still difficult in neurosurgery. The puncture aspiration with local fibrinolysis is one of the minimal invasive methods for treatment of intracerebral hematomas (ICH).

During 2000-2016, More than 200 patients with basal ganglia ICH experienced the burr hole surgery at the incidence of 6-12 hours under the guide of neuronavigation; which had obvious neurological improvement. The puncture and aspiration of liquid part of ICH (not more than 20% of ICH volume) is performed via small burr hole. Afterward the catheter is placed into ICH cavity and fibrinolytic (urokinase, UK) is injected via this catheter in postoperative period for lysis of ICH solid part. According to the current study, there is no consensus guideline in how much dose and how long UK uses in clinic. However, it is easy to cause intracranial infection through drainage-tube injection for the several times.

So we prepared a new controllable release of fibrinolytic system in Pluronic p105-UK and Pluronic F127-rtPA. Through a series of dissolution experiments in vitro and cerebral hemorrhage hematoma experimental animal model in vivo, we have proved that the system has the following characteristics: 1. It has the temperature-sensitive and self-assembly characters, which is a liquid at room temperature, body temperature turns solid; 2. It can be triggered and controlled to release the fibrinolytic drug by ultrasound; 3. The release of fibrinolytic (UK or rtPA) drugs can effectively dissolve hematoma; 4. without the effect of drugs in vivo slowly degradable, non-toxic side effects. These studies provide an effective method for the removal of residual hematoma in ICH using minimally invasive surgery.

1-P-44

New strategy of anastomosis in STA-MCA bypass surgery.

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Objective:

Stenosis and occlusion of the middle cerebral artery (MCA) may result in a critical condition. Thus, a neurosurgeon faces an urgent need to treat the disease. STA-MCA (superficial temporal artery to middle cerebral artery) bypass is effective as surgical option, while arterial anastomosis has a technical difficulty particularly on a narrow artery. Indeed, several complications have been reported, such as a damaged vessel in surgery. Here, we report a successful attempt for secure operative anastomosis in the STA-MCA bypass surgery.

Case report:

81-year old woman was taken to our hospital by ambulance due to dimmed vision. Apparent stenosis of the left MCA (high-grade M1 stenosis) was found by head MRI and MRA, while no neurological symptom was observed. As the patient and her family requested, the STA-MCA bypass surgery was employed despite her advanced age, considering prevention of a possible brain infarction or transient ischemic attack in the future. During an anastomotic operation, additional stay sutures were placed at the cut end of STA to avoid dissection of the wall of the artery. It is crucial to make sure that the lumen of STA is firmly opened in this procedure.

Conclusion:

We had a case of a left M1 MCA stenosis and the STA-MCA bypass surgery yielded successful prognosis. Thus, we propose the operative procedure to establish and maintain patency of the anastomosed vessels.

1-P-45

Endoscopic surgery of putamenal hematomas.

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The surgical strategy selection concerning hypertensive putamenal hematomas remains controversial and unclear till nowadays.

Objective: to evaluate the efficacy of endoscopy usage for the surgical treatment of haemorrhagic stroke of putamenal localization.

Materials and Methods: This study included 85 patients, among them 55 patients underwent endoscopic aspiration of hematomas and were included in study group and 30 patients with microsurgical treatment of hematomas were included in control group.

Results: the following treatment outcomes were achieved in the study group:

- successful – 2 (4%) patients;
- moderate disability – 12 (22%) patients
- severe disability – 32 (58%)
- vegetative state – 3 (5%) patients
- postoperative mortality – 6 (11%) patients

Results: patients in control group had the following outcomes: successful- 1 (4%) patient, severe disability - in 4 (17%) cases, profound disability - in 7 (23%). The mortality rate was 60% (18 patients).

When the received results were analysed and compared, it was found out that the combination of successful and moderate disability cases in the study group were 9% higher than in the control group. The mortality rate in the study group was 5-time less than in the control group ($p < 0.05$).

The presents of intraventricular haemorrhage significantly improved the outcomes in the study group, and on the contrary, reduced favourable outcomes and increased lethality in the control group ($p < 0.05$). The frequency of rebleeding was the same in two groups, but the lethality was twice less in the study group ($p < 0.05$).

Conclusions: Endoscopic aspiration allows improving the removal of the putamenal hematoma regardless of time and the volume of haemorrhage. Among patients with hematomas operated by endoscopic aspiration, postoperative mortality is 5-time less compared to an open surgery, and the number of relapses of intracerebral hematoma decreased in two times.

The complete/radical removal of putamenal hematoma during endoscopic aspiration surgery is not inferior to an open surgery, but is accompanied by a lesser intraoperative injury of the brain.

1-P-46

Treatment of MCA aneurysms a developing country perspective.

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Introduction

Aneurysms of the middle cerebral artery account for one-fifth of all aneurysmal subarachnoid haemorrhages.

MCA aneurysms are wide necked with major arterial branches arising at the aneurysm base, making surgical clipping the most effective treatment.

Despite good technical results, patients with MCA aneurysms can have surprisingly poor outcomes because the aneurysmal ruptures often produce both a subarachnoid haemorrhage and intracerebral hematoma & there is a high incidence of Vasospasm

AIM

A retrospective analysis of all surgically managed cases of aneurysms treated by a single chief surgeon till 2017 was undertaken

All available out and inpatient records were scrutinized and data recorded

The data was further analyzed with respect to aneurysms of the middle cerebral artery

The surgical technique used

The outcome of surgery and various factors affecting it.

Results

A total of 571 aneurysms had been surgically treated in our institution during the study period.

MCA aneurysms accounted for 147 of these lesions.

Majority of the patient were in their 4th and 5th decade.

Most of our patient presented with WFNS grade I, 8% were bilateral aneurysms. 80% had good and fair outcome where as 15% had poor outcome. 16 patients underwent silk ligation of the aneurysm neck. Where as majority of our patient underwent clipping of the aneurysms.

Conclusion:

MCA aneurysm account for up to one fourth of all aneurysms

They are most likely to present in the middle aged and elderly age group

Majority arise from the region of the bifurcation

Outcome was dependent on the grade of presentation.

Overall good outcome may be seen in up to 60% of all cases.

6% mortality was observed.

Ligation with silk is an safe and effective option in cases where the anatomy of the lesion is favorable.

It is less likely that adjacent vessels or perforators get caught in the ligation unlike aneurysm clips.

Meticulous training and understanding of the anatomy is very important in MCA aneurysm surgery.

1-P-47

INTRAOPERATIVE RUPTURE OF CEREBRAL ANEURYSM: ANAESTHESIOLOGIST'S CHALLENGE

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Subarachnoid haemorrhage (SAH) is one of the most dreaded neurological conditions, which not only has significant mortality but the related morbidity has major implications. Although, incidence of unruptured aneurysms is increasing globally, still intraoperative aneurysmal rupture (IOR) is a devastating complication with huge mortality and morbidity. Reported incidence from retrospective case series during microvascular surgeries is described to be between 7-40%. Induction of anaesthesia can lead to sudden rupture of aneurysm in 1-2% cases, with a reported mortality rate of about 75%. Clinically, unexplained sudden hypertension and bradycardia may indicate an IOR during coiling or clipping procedures. Anaesthetic management of intraoperative rupture before Dural opening include various goals of management include ICP reduction and neuroprotection. Haemodynamic goals include lowering of blood pressure by 20% from baseline during IOR. Various techniques may be implemented to blunt sympathetic stimulation so as to achieve haemodynamic stability to avoid rupture or re bleed. These include use of IV lignocaine, esmolol or labetalol to reduce stimulation during airway manipulation. Other management goals include reducing the cerebral metabolism and lowering the abruptly increased ICP by ventricular drainage. Adenosine induced flow arrest transiently may improve aneurysmal neck visualization. Various neuroprotective mechanisms include hypothermia, hyperoxygenation, avoiding hyperthermia, maintaining euglycemia, haemodilution, hypervolemia and hypertension.

1-P-48

Dural arteriovenous fistula with vein of galen dilatation mimicking vein of galen malformation in adult

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Purpose: Vein of Galen malformation is an uncommon intracranial vascular abnormality, and this malformation is caused by the persistence of a cerebral arteriovenous fistula of the median prosencephalic vein—a precursor of the vein of Galen at 6–11 weeks gestational age. Most of the cases are found during the neonatal or childhood period; in contrast, it is rarely found in adult patients. The clinical manifestations include headache, seizure, hydrocephalus, calcified pineal mass, and subarachnoid or intracerebral hemorrhage. We described a case of dural arteriovenous fistula with vein of galen dilatation by endovascular embolization that patient with headache that presented vein of galen dilatation in imaging study.

Case: A 49-year-old woman presented with headache and nausea during 1 month. She had no significant medical illness history. No neurologic deficit was found. Computed tomography of the brain showed mass like lesion around third ventricle. Further computed tomography angiography showed the presence of a large dilated vein of galen involving with multiple feeder on both side. Conventional cerebral angiography showed arteriovenous fistula around vein of galen supplied by both internal and external carotid artery and right vertebral artery drained to straight sinus. Vein of galen was presented early arterial phase in dilated appearance.

Result: We treated with Onyx embolization through left superficial temporal artery. Total 3cc injected. Then, post-operative conventional angiography was not showed arteriovenous fistula and arterial phase venous structure. She had not any clinical symptom after procedure.

Discussion: Endovascular embolization has considerably improved outcomes in patients with dural arteriovenous fistula (dAVF). In the past, mostly dAVF with dilated vein of galen was misunderstand vein of galen malformation. For successful treatment, there were considered to be exact diagnosis. The results of therapeutic options chosen all contribute to the body of information to be referenced when treating similar patients in the future.

1-P-49

Surgical strategy of complex intracranial aneurysms a developing country experience

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Introduction:Complex intracranial aneurysms are difficult to manage and need expertise and therapeutic skills. They are considered complex if they are Giant, present in difficult locations, had multiple lobules with adherent embedded fundus, has wall calcification, intraluminal thrombus, perforators or branches arising from fundus or neck and the most difficult, are recurrence after previous treatment.

Objectives:to demonstrate the difficulties, in managements in absence of some facilities and financial obligations.

Materials:Twenty five cases of carotid cerebral aneurysms were reviewed retrospectively over two years duration 2013-2015. CT angio, MR angio and 3D digital subtraction angiography were performed in all cases to help better visualisation and better management. Balloon occlusion test needed for showing collateral circulation in 9 patients.

Results:The commonest presenting symptoms were coma or convulsions in 11 cases (44%) then retro orbital pain and cranial nerve palsies in 6 cases (24%). The most frequent location was the internal carotid artery (64%), next came the Middle cerebral artery (20%), then Anterior communicating artery (16%)

The treatment strategy varied from direct surgery, in 52% of cases, to Endovascular in 40% and combined in 8%. Surgery varied from direct clipping by single or multiple clips in 10 cases (40%) or vessel wall reconstruction in four (16%). Endovascular procedures were done in 10 cases, either detachable coils, stent assisting or flow divertors.

Bypass surgery was done in five cases (20%) as prerequisite to coiling (4%) or clipping (16%).

The outcome was 72% good improvement and 16% had partial improvement and 12% were severely handicapped.

Conclusions: There is no single procedure recommended, each case should be tailored but planned combined procedures, may prove better, therapeutic skills and expertise is needed for proper decisions.

2-P-1

Dissection strategy of the Sylvian fissure and MCA aneurysms using 3D curved-MPR (multiplanar reconstruction) images

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Introduction: Sylvian fissure (SF) dissection is a key procedure in cerebrovascular surgery, especially MCA aneurysm clipping. The purpose of this study is to introduce the method of preoperative evaluation of Sylvian fissure in microsurgery of middle cerebral artery aneurysm using 3D-curved MPR (multiplanar reconstruction) images and to suggest a strategy or an algorithm of the dissection of the SF and MCA aneurysms. **Method:** Axial images (1.5 mm thickness) from brain CT angiography were exported in a DICOM format and were imported to OsiriX MD imaging software (Pixmeo Inc., Geneva, Switzerland). The first step was to produce 3D MPR images. The second step was to define a curved line along the sphenoid ridge on the images. The final step was adjusting the settings of the working screen by changing several factors. Then, the 3D MPR images at 4 points on the curved line on the sphenoid ridge were made (Point 1: ICA bifurcation, Point 2: the midpoint between ICA bifurcation and aneurysm neck, Point 3: aneurysm neck, and Point 4: M2 portion distal to a MCA aneurysm). The images of each point were analyzed, and objective measurements such as location and width of the SF, depth and course of the MCA were obtained. **Result:** We made the algorithm by considering the following factors. First, ruptured or unruptured state, Second, MCA course, especially, Point 2 & 3 relationship, Third, feasibility of sylvian dissection at each point, Fourth, aneurysmal features (dome direction, aneurysm depth and adhesion with cortex and dome). **Conclusion:** Although further studies are necessary, the algorithm of this study might be helpful in the systemic approach to sylvian dissection and clipping, especially in young cerebrovascular neurosurgeons. In addition to conventional image studies, 3D curved-MPR images and this algorithm seem to provide useful information for Sylvian dissection in the microsurgical treatment of MCA aneurysms.

2-P-2

Correct Plane of the Sylvian Vein Dissection for Middle Cerebral Artery Aneurysm Using Indocyanine Green Videoangiography

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BACKGROUND: Preservation of the superficial Sylvian veins (SSVs) is essential to prevent neurologic deficits during Sylvian dissection. We describe an appropriate surgical approach for unruptured middle cerebral artery (MCA) aneurysms to preserve these veins by using indocyanine green videoangiography (ICG-VA).

METHODS: Between August 2014 and August 2015, we performed microsurgical clipping for 37 unruptured MCA aneurysms in 36 patients. We classified all of the cases into 3 types according to the location between the Sylvian fissure and the SSV. We defined 3 surgical approaches (frontosylvian, intersylvian, and temporo-sylvian) based on the SSV and investigated the proper surgical approach according to the type of case.

RESULTS: In our study, most SSVs were located above the Sylvian fissure (fissure type, 64.9%). The SSV was located on the temporal lobe in 10 cases (temporal type) and on the frontal lobe in 3 cases (frontal type). The frontosylvian approach (splitting between the SSV and frontal lobe) was performed in all of the patients with temporal type; the temporo-sylvian approach (splitting between the SSV and temporal lobe) was performed in all of the patients with frontal type and single SSV of fissure type. The intersylvian approach (splitting between the frontal and temporal SSV, or among multiple SSVs) was successfully performed in the patients with double or multiple SSVs of fissure type. No venous complications occurred that were related to the surgical approach.

CONCLUSIONS: Correct dissection strategy using intraoperative ICG-VA is greatly useful to define the optimal surgical approach without vein injury.

2-P-3

Results of Microsurgical Clipping of Paraclinoid Aneurysms: Avoidance of Complications

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Introduction : We present our microsurgical experience of 39 consecutive patients with paraclinoid aneurysms to propose our personal strategies to avoid complications. Based on our experiences, we suggest which patients are more suitable to clipping.

Material and Method : In thirty nine patients, we underwent microsurgical clipping of forty-two aneurysms. Aneurysms were classified based on Barami's proposal. According to the classification, Type III (a) was the most common type. Operative strategies were planned according to preoperative imaging studies, and a pterional-transsylvian approach was routinely used. We evaluated complication rates according to the types of aneurysm.

Results : All aneurysm necks were directly clipped. Two patients (5%) died. In three patients (7%), their visual acuity decreased. In two patients (5%), transient third nerve palsy developed and resolved 2 months after surgery. The causes of visual worsening are 1) excessive manipulation of the optic nerve, 2) delayed inflammation and 3) anatomical variance (interdural origin of the ophthalmic artery). All complications occurred during the procedure of complete circumferential excision of the distal dural ring.

Conclusions : To avoid complications, decompression of the optic canal, removal of optic strut and circumferential resection of the distal dural ring (DDR) are essential techniques. Aneurysms with type 1 and II may be considered to be more suitable to clipping.

Key words: paraclinoid aneurysm, complication

2-P-4

Effect of carotid plaque types on radiological and clinical outcomes: Carotid angioplasty with stent versus Carotid endarterectomy

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Purpose: The types of carotid plaque have been regarded as independent predictors of stroke. The purpose of this study was to evaluate the effect of the plaque types on revascularization procedures such as carotid angioplasty with stent (CAS) and endarterectomy (CEA).

Materials and Methods: Plaque types were classified as fatty, calcified and mixed types based on multi-detector row computed tomography (MDCT) imaging findings. We evaluate the types and diameter of the carotid artery peri-operatively in patients underwent CAS (n=45) and CEA (n=36) in a retrospective manner. We also evaluated clinical outcomes.

Results: Mixed type was most common in both groups. Fatty and mixed types were associated with newly developed cerebral infarctions in both groups. Calcified and Mixed types caused focal stenosis postoperatively in CAS group (p<0.01). However, it did not affect clinical outcomes within one-year period. Embolic event was proven as an important poor prognostic factor rather than occlusion time during the procedures.

Conclusion: The types of carotid plaques determined by MDCT reflect outcomes after revascularization procedures. Based on the MDCT imaging, physicians should be aware of the potential complications and try to prevent them. Longer follow-up is needed to find out effects of the focal stenosis in CAS group.

Key words: Plaque, Carotid stenosis, Angioplasty, Stent, Endarterectomy, Computed tomography

2-P-5

Early STA-MCA bypass in thrombosed aneurysm with acute symptomatic ischemic stroke

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Background

Intra-arterial thrombolysis is the standard treatment for acute ischemic stroke, however, if the ischemic stroke occurred in just distal to thrombosed giant aneurysm, thrombolysis may be difficult. Moreover, if a superficial temporal artery (STA) to middle cerebral artery (MCA) bypass is performed before recovery of destructed Blood-Brain-Barrier following acute ischemic stroke, it is likely to cause complication such as hypo or hyperperfusion syndrome. But, it is still doubtful that surgery of patient with rapidly worsening neurological symptoms should be delayed. In this report, we evaluated the efficacy of early STA-MCA bypass in thrombosed giant aneurysm with acute symptomatic ischemic stroke.

Materials and Methods

We evaluated two patients with thrombosed giant middle cerebral artery aneurysm. Brain computed tomography angiography (CTA), digital subtraction angiography (DSA), perfusion magnetic resonance imaging (MRI) were used to evaluate V/Q mismatch.

Results

Case 1

A 73-year-old male was admitted to our hospital with rapidly worsening dysarthria and right side weakness (Gr. IV-IV-). MRI revealed acute infarction in left frontal, temporal and insular lobes. DSA and perfusion MRI were performed and demonstrated 2.5 cm-sized thrombosed giant aneurysm in left middle cerebral artery bifurcation (MCAB) with decreased MCA flow and severe V/Q mismatch. So, emergent aneurysm trapping and subsequently bypass was performed in frontal and parietal branch of superficial temporal artery to middle cerebral artery.

Case 2

A 62-year-old male was admitted to our hospital with rapidly worsening right side weakness. MRI, CTA and DSA revealed 1.3cm-sized thrombosed aneurysm in left MCAB with multifocal embolic infarctions. A follow-up MRI revealed occlusion at M1 segment of left MCA with acute infarction in left basal ganglia and insular lobe. So, Emergent removal of aneurysm was and subsequently bypass was performed in frontal and parietal branch of superficial temporal artery to middle cerebral artery.

Conclusions

STA-MCA bypass is useful in the treatment of hemodynamic stroke. Performing in the acute phase may increase the risk of complications. So, early surgery has been avoided. However, if neurological symptoms worsen quickly due to the compromised hemodynamic impairment as our cases, early bypass surgery can prevent additional deterioration.

2-P-6

Prospective study on primary intraventricular hemorrhage in Chinese adults

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Background: Primary intraventricular hemorrhage (PIVH) is a rare type of hemorrhagic stroke that is poorly understood. We aimed to explore the clinical features and outcome of this disease in Chinese population via an institutional prospective study.

Method: Adult patients diagnosed with PIVH from January 2013 to January 2016 were enrolled in this study. Data, including clinical variables, radiologic features and yield of angiography were collected to establish a novel etiological classification and prognostic factors of this disease.

Result: A total of 67 patients were diagnosed as PIVH which constituted 3.2% of contemporary patients with hemorrhagic stroke in our hospital. PIVH could be divided into two main types and eight subtypes. Patients with PIVH caused by cerebrovascular lesions were diagnosed as having vascular structural abnormality (VSA)-related PIVH (n=34, 52.3%), which included four subtypes including AVM-induced PIVH (17.9%), Moyamoya disease-induced PIVH (22.4%), aneurysm-induced PIVH (7.5%) and other rare lesion-induced PIVH (3.1%). PIVH patients without direct etiology were considered as idiopathic PIVH (n=31, 47.7%) including hypertension-related PIVH (29.3%), medication-related PIVH (4.6%), systemic disease-related PIVH (0%) and PIVH with unknown reason (13.8%). Patients with VSA-related PIVH were younger than idiopathic PIVH patients (37.1 ± 14.6 yrs. Versus 56.9 ± 12.4 yrs.) and idiopathic PIVH patients were more commonly hypertensive (24.1% Versus 75.9%). The overall mortality rate in our study was 11.9% and 21 patients (31.3%) had a poor outcome. Results from multivariate regression analysis revealed that patients with younger age, lower Graeb score and subtype of AVM-induced PIVH might be associated with a favorable outcome.

Conclusion: 1. The etiological causes and prognostic factors for patients with PIVH were associated with distinctive features in the Chinese population, which merited that thin-slice CT scan, CTA, and DSA be performed as routine. 2. In our study, we supposed that the incidence of PIVH may be overestimated and the PIVH secondary to Moyamoya disease may be underestimated in Chinese patients. 3. A novel classification of PIVH based on etiology PIVH was established. 4. PIVH patients with different etiological causes might be associated with different clinical outcome.

2-P-7

Neuroprotection of nalmefene for postoperative patients with spontaneous intracerebral hemorrhage

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Background: Endogenous opiates play an important role in the secondary injury of brain tissue after central nervous system injury. It was confirmed that nalmefene, an opiates receptor antagonist, has neuroprotective efficacy in animal models. However, evidence of nalmefene treatment for surgical patients with spontaneous intracerebral hemorrhage is insufficient.

Methods: Outcomes of patients treated with nalmefene were compared with that of patients without any anti-opiate treatment. The primary outcome was functional outcome at 6 months post ictus, which was assessed using modified Rankin Scales. Secondary outcomes included mortality in 30 days post ictus, state of consciousness evaluated using Glasgow Coma Scale at 1, 3, 7 days post operation and complications.

Results: Of 79 patients in the nalmefene treatment group, 22 (27.85%) had a favorable functional outcome at 6 months, while in the control group, 12 of 72 (16.67%) had the same result ($p=0.273$). A significantly better outcome was observed in the surgical group during only one subgroup analyses which was Glasgow Coma Scale (GCS) between 3 and 8 (32.26% vs 6.45%, $p=0.006$).

Conclusions: Nalmefene treatment was safe for patients with spontaneous intracerebral hemorrhage but could not improve the outcome of either short-term consciousness or long-term functional outcome.

2-P-8

Seizure prophylaxis in patients with acute spontaneous supratentorial intracerebral hemorrhage: a randomized, double-blind, placebo-controlled trial

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Aims & Objectives: Seizure is a common complication of intracerebral hemorrhage (ICH), which may result in neurological deterioration and have negative impact on functional outcome. High quality evidence on seizure prophylaxis in ICH is insufficient.

Materials and Methods: 258 patients were randomly allocated (1:1) to receive 7-day prophylaxis of sodium valproate or matching placebo. Patients were followed up for 6 months. The primary outcomes were early (≤ 7 days) and late onset seizures (> 7 days). Secondary outcomes included fever, pulmonary infection, urinary infection, enlargement of hematoma, digestive tract bleeding, adverse effects, and functional outcome.

Results & Discussions: Early seizure was detected in 9 (7%) patients in treatment group and 17 (13.2%) patients in placebo group ($P=0.098$). Late seizure was detected in 11 (8.7%) patients in treatment group and 17 (14.4%) patients in placebo group ($P=0.158$). Subgroup analysis was conducted based on the GCS score, hemorrhage location and procedure of surgery, with negative findings. The mortality rate was similar between two groups at 7 days, 1, 3, and 6 months. Functional outcome was similar between groups ($P=0.744$ for GOS; 0.639 for mRS). No by-treatment difference was detected with regard to fever, pulmonary infection, urinary infection, digestive tract bleeding, or hematoma growth.

Conclusions: short-term sodium valproate prophylaxis in patients with acute supratentorial ICH is safe, but could not decrease the risk for early seizure or late seizure. Besides, it could not improve the 6-month functional outcome.

2-P-9

Comparison of hematoma density heterogeneity and ultraearly hematoma growth in predicting hematoma expansion in spontaneous intracerebral hemorrhage

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Background: Hematoma density heterogeneity (HDH) and ultraearly hematoma growth (uHG) are novel imaging predictors for hematoma expansion (HE) based on computed tomography (CT). This study was aimed to compare the accuracy of HDH and uHG in HE prediction within a cohort of sICH patients.

Methods: This study included sICH patients with initial CT within 6 hours after onset. uHG was defined as baseline hematoma volume/onset-to-CT time (ml/h) and the cutoff was 4.7 ml/h. HDH was evaluated following a 5-point categorical scale and HDH grade was dichotomized into homogeneous (1-2) and heterogeneous (3-5). The predictive accuracy of HDH and uHG was analyzed by receiver-operator analysis.

Results: A total of 137 patients were included in this study. The mean uHG and median HDH grade were significantly higher in patients with HE. In multivariable analysis, $uHG \geq 4.7$ and $HDH \text{ grade} \geq 3$ were associated with HE independently. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of $uHG \geq 4.7$ were 76.5%, 57.3%, 37.1%, and 88.1%, respectively. The sensitivity, specificity, PPV and NPV of $HDH \text{ grade} \geq 3$ were 55.9%, 70.9%, 39.8% and 83.0%, respectively.

Conclusions: Both HDH and uHG are promising predictors for HE. HDH has higher specificity while uHG is more sensitive.

2-P-10

Aneurysm surgery without retractors – An Institutional review.

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Introduction –

Intracranial aneurysm surgery is one of the finest neurosurgical procedure. Self retaining brain retractors are indispensable tools in aneurysm surgery, which allow a neurosurgeon to work in a confined. However, retractors tend to produce ischemic brain damage due to continuous pressure on brain surface, iatrogenic injury to brain and minimize the space available for negotiating the instruments. Hence we have used a technique wherein use of retractors during aneurysm surgery is avoided.

Aims and objectives –

To evaluate the feasibility of performing intracranial aneurysm surgery, without using any retractor system, study the associated technical difficulties and assess the overall impact on patients' outcome.

Materials and Methods –

Study involved 234 patients of intracranial aneurysm operated for aneurysmal clipping during the period of Jan 2013 to June 2017. Our operative technique comprised of skull base approaches with adequate bony removal, early opening of arachnoid planes, CSF diversion, hyperosmolar therapy and normocapnic ventilation which helped us to achieve adequate brain relaxation. Thus use of retractor was completely avoided in these patients.

Observation and results –

Out of 234 patients undergoing aneurysm surgery, 124 were female while 110 were male. 204 patients had anterior circulation aneurysm while 30 patients had posterior circulation aneurysm. Retractor was required in 3 patients during surgery due to intraoperative rupture of the aneurysm. Most of the patients demonstrated good outcome after surgery, however patients with high grade Subarachnoid hemorrhage developed features of vasospasm which was managed accordingly. We did not encounter any significant complication associated with retractorless surgery.

Conclusion –

Self retaining brain retractors are valuable in aneurysm surgery, however their use is not without risk. Good anesthesia, proper positioning, adequate bony removal and judicious opening of arachnoid planes have made aneurysm surgery without retractors possible preventing ischemic injury to the brain and improving the outcome.

2-P-11

Use of Intraoperative Dual-volume 3-Dimensional Volume-Rendering Rotational Angiography Immediately Following Surgical Clipping of Cerebral Aneurysms

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Introduction

To assess the obliteration results after aneurysmal clipping, several intraoperative imaging modalities, including two-dimensional digital subtraction angiography (2D-DSA) and indocyanine green videoangiography (ICG-VA), have been widely used. In nowadays, volume-rendering (VR) display of three-dimensional rotational angiograph (3D-RA) could be generated in a hybrid OR to assess the aneurysm-clip configuration intra-operatively. In this study, we reported our experience in using intraoperative 3D-RA for intracranial aneurysmal clipping.

Materials and Methods

We reviewed 24 patients with 35 clipped intracranial aneurysms between November 2016 and June 2017. All procedures were performed in a hybrid OR equipped with a monoplanar angiographic system. Following clipping, neurosurgeons evaluated the aneurysm-clip configuration and adjusted the clip, if necessary, based on ICG-VA, followed by 2D-DSA and dual volume 3D-RA VR imaging. We analyzed the incidence of clip repositioning. Univariate analysis was applied to determine which aneurysmal factor predicted the repositioning event following angiographic assessment.

Results

Our series comprised 3 men and 21 women. 16 (45.7%) aneurysms were ruptured, 10 (28.6%) were more than 7 mm, and 12 (34.3%) had a wide neck. Aneurysm sites were ICA in 17 (48.6%) aneurysms, MCA in 12 (34.3%), and ACA in 6 (17.1%). Based on ICG-VA, clip repositioning was required in 4 (11.4%) aneurysms. 3D-RA VR imaging assessment detected residual aneurysmal filling in 5 aneurysms and vessel stenosis in 5, for a total of 6 (17.1%) aneurysms requiring additional clip adjustments. Aneurysms with larger size ($p=0.043$) and wide neck ($p=0.012$) were significant predicting factors associated with the requirement of clip repositioning.

Discussions

The present study showed that the high-quality 3D-RA imaging provided by hybrid OR enabled neurosurgeons to visualize the detailed relationship between the aneurysms, vessels and the clips in various angles intraoperatively. While ICG-VA remained a reliable tool to evaluate the aneurysm intraoperatively, our series showed that 3D-RA detected additional 17% of small aneurysmal remnants or vessel stenosis which were missed on ICG-VA. This was of particular relevance in aneurysms of larger size or wider neck. Therefore, we advocated that intraoperative 3D-RA should be recommended as an optimal intraoperative adjunct to ICG-VA for evaluating post-clipping intracranial aneurysms.

2-P-12

Surgical Management of Blood Blister-like Aneurysms of the Internal Carotid Artery: Results of a 10-Year Single-Center Experience

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BACKGROUND: Blood blister-like aneurysms (BBAs) located at non-branching sites of the internal carotid artery (ICA) are relatively rare and surgical treatment continues to be challenging and technically demanding due to their fragile and thin wall. The optimal treatment strategy for BBA has not been clearly defined.

OBJECTIVE: To review our experience with the surgical treatment of BBAs at supraclinoid segment of ICA.

METHODS: We retrospectively reviewed all patients with BBA treated surgically at our institution between 1997 and 2017. The treatment strategy, operative techniques, outcomes and procedure-related complications were analyzed.

RESULTS: Thirty patients (20 female, and 10 male) with BBAs of the ICA were identified. The mean age was 42.8 years (range 32-54 years). All patients presented with subarachnoid hemorrhage (SAH). The aneurysm size ranged from 2.5 to 8.6 mm. All patients were successfully treated using microsurgical techniques, including direct clipping in 25 patients, clipping on wrapping in 3 and trapping in 2 cases. Intraoperative rupture occurred in 5 cases, all associated with attempted direct clipping; the 5 cases were successfully managed. Five patients died of massive cerebral infarction. A favorable outcome was achieved in 22 patients (73.3%) at the mean follow-up of 89.6 months. Follow-up angiography was available in 20 patients and revealed complete obliteration of all aneurysms.

CONCLUSION: BBAs of the supraclinoid ICA are difficult to treat due to their clinical and pathological features. Preoperative adequate awareness of these lesions and applying of various surgical strategies during surgery can improve clinical outcomes.

2-P-13

Low-profile visualized intraluminal support stent assisted coil embolization using IV Tirofiban in the treatment of ruptured intracranial aneurysms

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Background and purpose : The purpose of this study was to evaluate the safety and effectiveness of Low-profile visualized intraluminal Support device(LVIS or LVIS Jr. stents) using IV Tirofiban in the treatment of ruptured wide-necked intracranial aneurysms.

Methods : A retrospective analysis was performed of 31 patients comprising 31 aneurysms in which LVIS or LVIS Jr. stents with IV Tirofiban were used for stent-assisted coil embolization of ruptured intracranial aneurysms from March 2015 to March 2016, including all clinical and angiographic data as well as follow-up.

Results : The median age of the patients was 61.9 years (range 40–87) and 25 (81%) were women. All aneurysms was ruptured. Twenty-one (67.7%) were located within the anterior circulation and the remaining 10 (32.3%) were located in the posterior circulation. Five aneurysms (16.1%) were treated using double stents. Immediate total occlusion was observed in 13(41.9%), residual neck in 16(51.6%) and residual sac in 2(6.4%). Procedural related complication occurred in one case and delayed complication at 2 weeks later in one case. Three cases occurred EVD related hemorrhage. One patient was expired due to severe brain swelling. Four patients was loss of follow up. Follow up Angiography (mean : 12.6 months) was performed in 26 patients. 2 patients was major recanalization, 3 patients remained remnant neck. No other events occurred during clinical follow up.

Conclusions : Low-profile visualized intraluminal Support device(LVIS or LVIS Jr. stents) using IV Tirofiban in the treatment of ruptured wide-necked intracranial aneurysms seems to be relatively safe and effective.

2-P-14

Parent artery occlusion based on balloon test occlusion for the treatment of complex ICA aneurysms

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Objective:

Nowadays flow diversion treatment, such as pipeline has been introduced for complex internal carotid artery (ICA) aneurysm. However with increasing experience, some of limitation and complication has been recognized. This study describes parent artery occlusion (PAO) with/without bypass surgery strategy based on balloon test occlusion (BTO) and results obtained in case of unsuitable for coiling or flow diversion technique.

Methods:

The indication and selection of bypass were determined based on balloon test occlusion of the ICA. Our protocol of bypass as follows. If there are any neurologic deterioration during ipsilateral ICA occlusion or decrease of regional CBF was measured by single photon emission computed tomography (SPECT). The parent artery occlusion with or without intra-aneurysmal occlusion was performed by using detachable coils or pushable coil after patency of the constructed anastomosis was confirmed. Perioperative infarction related with surgical manipulation, patency of the anastomosis was assessed by diffusion-weighted magnetic resonance imaging and angiography. Regional CBF was measured by HMPAO-SPECT

Results:

A total of 4 cases with ICA aneurysms underwent surgery in our institution between 2010 and 2017. Among these patients 3 patients had large (equal to or larger than 10mm) to giant (equal to or larger than 25 mm) aneurysms. Only one patient had dissecting aneurysm. One patient presented with subarachnoid hemorrhage and these were embolised within 72 h. Overall outcome at discharge was good. No patients suffered symptomatic embolic or infarction associated with the surgical manipulations. Preoperative cranial nerve pareses improved completely or partially in all patients. CBF showed no significant difference between the surgical and non-surgical cerebral hemispheres. No cerebral ischemic event was observed during the follow-up period (mean 1.4 years).

Conclusion:

Parent artery occlusion based on balloon test occlusion provide a convenient, safe, and effective way for the treatment of complex internal carotid artery aneurysms

2-P-15

Clinical Research of Willis Covered Stent in the Treatment of Complex Intracranial Aneurysms

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Objective: To summarize the experience of treatment for complex intracranial aneurysms. And to discuss the efficacy, safety and complications of Willis covered stent for treating the intracranial aneurysms.

Methods: Endovascular procedures were performed in 38 patients with intracranial aneurysms using Willis covered stent. 4 patients with 2 covered stents, 1 patient with 3 covered stents, 1 patient with 4 covered stents.

Results: All procedures were successfully completed in one time. For 2 patients are unable to deliver the Willis covered stent to the segment with aneurysm due to the tortuous vascular. 36 patients (94.7%) implant the Willis covered stent successfully. 31 patients (86.1%) have completed occlusion and 5 patients (13.9%) have minor endoleaks during the immediate postoperative period. 29 patients are followed-up by CTA、MRA、DSA for 3 to 12 months, 2 patients find in-stent stenosis, 1 patient find aneurysm recurrence by angiography after 3 months of the surgery. 28 patients (96.5%) are completely occluded.

Conclusion: It is a safe and effective way to treat intracranial complex aneurysm by the Willis covered stent. 1) It has higher occlusion rate and lower recurrence rate in treating intracranial complex aneurysm; 2) postprocedure hemorrhage and endoleaks should be concerned; 3) The application of Willis covered stent is restricted by its stiffness, and it may occlude important vascular branches or perforators.

2-P-16

Serpentine Cavernous Aneurysm Presented with Visual Symptoms Improved by Endovascular Coil Trapping : A case report

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Introduction : Patients with a large or giant aneurysm of the internal carotid artery(ICA) located in the paraclinoid area often present with cranial nerve symptoms. Cavernous ICA aneurysm can have a mass effect on the oculomotor, trochlear, or abducens nerve, resulting in internal or external ophthalmoplegia. We report a patient with a serpentine cavernous ICA aneurysm who presented with visual symptoms that progressively improved after endovascular coil trapping.

Case report : A 44-year-old woman presented with decreased right visual acuity of 1 month duration. The examination showed a decrease in her right visual acuity to 0.04 compared to 1.0 on the left side. The right visual field showed a 3/4 defect involving all but the right lateral upper quadrant. On brain MRI, a large aneurysm 19 x 12mm in size, well marginated, with a heterogenous signal void was seen in the right parasellar region, in the cavernous sinus. The lesion identified on TFCA (Transfemoral catheter angiography) was 11.72 x 22.49mm serpentine aneurysm on right ICA. We chose to perform coil embolization of the large serpentine aneurysm with occlusion of the parent artery. Nine months after coil embolization, the patient's visual field and visual acuity had improved considerably.

Conclusion : Patient with a large serpentine aneurysm presenting visual disturbances can be treated successfully with coil embolization after careful studies of the intracranial hemodynamics.

Keywords : Internal carotid artery, Fusiform aneurysm, Visual acuity

2-P-17

Cerebral aneurysm coiling simulation using patient-specific 3D printing : from lab to real angio suite

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Endovascular treatment is evolving field and acceptable complication rate getting lower. In addition, changes in practice patterns have decreased the volume of specific cases for each practitioner, such as aneurysm coiling, which reduces the opportunity for intervention suite. Therefore, practitioners need training for endovascular treatment for their certified experience and procedural skills. In addition, even expert also need patient specific model for planning patient treatment, and training new developed device. The authors developed a hands-on, dimensionally patient specific model for aneurysm coiling using patient anatomic data and three-dimensional (3D) printing. Design of the model focused on prevalence of aneurysm, level of difficulty and point of teaching. We report a preliminary series of endovascular planning with 3D printed aneurysm model.

An aneurysm model was printed based on the patient data acquired from the 3D rotational angiogram and CT angiography. A hollow aneurysm model with an identical vessel and aneurysm lumen to the actual anatomy was constructed with use of the 3D printed model as a mold and 3D virtual molding technique.

Through the 3D manufacturing process, a patient-derived simulator was developed for endovascular treatment before procedure. A microcatheter shaping mandrel was formed to identically line the 3D curvature of the parent vessel and the long axis of the aneurysm. With use of the model, treatment plan was more precise and procedure time also shorter. Also learner could practice same patient model for their training without any complication. They can shape microcatheter and validated for the accuracy with the model.

The proposed aneurysm coiling simulator has the potential to improve learning experiences in medical environment. 3D printing and elastomeric casting can produce patient-specific models for treatment planning that add value to endovascular training and preparation.

2-P-18

Usefulness and limitation of NIRS monitoring during endovascular thrombectomy in acute ischemic stroke

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Endovascular thrombectomy is recommended when recanalization is not achieved by intravenous administration (IV) of recombinant tissue-plasminogen activator (rt-PA) alone and ischemic penumbra still exists. Although endovascular thrombectomy is a powerful treatment for major cerebral artery occlusion, monitoring recanalization and reperfusion during acute ischemic stroke is a challenge for therapeutic assessment. There is a preceding review on the usefulness of near-infrared spectroscopy (NIRS) in intraoperative monitoring during an emergency endovascular thrombectomy for an acute large ischemic stroke as a carotid artery occlusion. We experienced NIRS monitoring in three acute stroke patients including two carotid artery occlusions (large ischemic stroke) and distal MCA occlusion (not large ischemic stroke), who were treated with endovascular thrombectomy. Regional saturation of oxygen (rSO₂) measured by NIRS was excellently responded to recanalization of the internal carotid artery in two patients. On the other hand, one distal MCA occlusion didn't detected a change in rSO₂. We confirmed the usefulness of NIRS in intraoperative monitoring during emergency endovascular thrombectomy for large acute ischemic stroke as carotid artery occlusion. We also demonstrated the limitation of NIRS in intraoperative monitoring during emergency endovascular thrombectomy for not large acute ischemic stroke as distal MCA occlusion.

2-P-19

Efficacy of Drip, Ship, Retrieve Method by Helicopter Transportation and Teleradiology for Acute Ischemic Stroke in Isolated Islands, Nagasaki Prefecture, Japan

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Purpose: Our hospital is part of a hub-spoke type system with 12 hospitals in remote islands, using a teleradiology system and three types of helicopter transport. We are able to transfer emergent patients from these islands to our hospital all the time. We examined the efficacy of the drip/ship/retrieve (DSR) method for dealing with patients on these isolated islands with acute ischemic stroke.

Methods: We reviewed 75 acute ischemic stroke patients receiving tissue plasminogen activator (t-PA) therapy from 2010 to 2017. The patients were divided into two groups: a DS group (receiving t-PA on the islands) and Direct group (receiving t-PA in our hospital). The mean age was 73.6 years in the DS group and 70.5 years in the Direct group. Three types of helicopter were used in the DS group: doctor helicopter, 13 cases; Marine Self Defense Force helicopter, 8 cases; and prefecture firefighting disaster prevention copter, 2 cases. The average distance of transport from the islands was 114 km. The average NIHSS was 15.2, and the symptom onset-to-needle time was 182 minutes on average in the DS group. Endovascular treatment via the DSR method was performed in 26.1% of the DS group and in 31.3% of the Direct group. Symptomatic intracranial hemorrhage was not observed in the DS group but was observed in 9.3% of the Direct group. The rate of patients achieving a modified Rankin scale ≤ 2 was 39.1% in the DS group and 42.3% in the Direct group.

Conclusion: The drip/ship method seems to be feasible and safe for use in patients located on isolated islands. Shortening the needle time-to-arrival at our hospital might help broaden the indications for "retrieval".

2-P-20

Effects of spinal cord and motor cortex electrical stimulation on neuropathic pain caused by stroke -Are they potent surgical candidates for CPSP?-

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It is known that neuropathic pain occurs after stroke in the certain rate and this pain called central post stroke pain (CPSP) is reluctant to the various treatments. We reviewed 125 cases of CPSP to reveal the significance of the surgical treatment for CPSP. In our series, CPSP occurred after intracerebral hemorrhage in 87 cases, cerebral infarction in 36 cases, and AVM in 2 cases. All patients were treated with medication firstly, and pain clinical treatments such as nerve block were applied additionally to the medication-resistant cases. Forty cases underwent implantation surgery of the stimulation electrodes onto spinal dorsal column (SCS) and/or motor cortex (MCS) in an attempt to reduce the residual pain after the aforementioned non-surgical treatments according to the patients' requests. Visual analog scale (VAS) was measured before and after the treatments, and the effects of the treatments were defined when the ratio of VAS after to before the treatments was 0~25% as excellent, 25~50% as good, 50~75% as fair, and 75~100% as poor. The effects of non-surgical treatments were excellent in 15 cases (12%), good in 44 cases (35.2%), fair in 32 cases (25.6%), and poor in 34 cases (27.2%) during the follow-up period of 43.6 months in average. Among 66 cases resulted in fair and poor results, 40 and 2 cases underwent SCS and MCS, respectively. During the follow-up period of 59.6 months in average, the effect of SCS was excellent in 8 cases (20%), good in 15 cases (37.5%), fair in 10 cases (25%), and poor in 7 cases (17.5%). One good and one fair results were obtained after MCS, which meant pain was reduced to less than half in 57.1% of the operated patients after SCS and/or MCS. After all, pain was reduced to less than half in 83 out of 125 CPSP patients (66.4%) after both/either non-surgical and/or surgical treatments. These results may indicate the significance of the surgical stimulation therapy contributing to the improvement of prognosis in the stroke patients from a different point of view as compared to the the established procedures such as aneurysmal clipping and endovascular surgery.

2-P-21

Crucial risk factors for postoperative enlargement of basal ganglia hematoma after stereotactic aspiration.

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Objective : Stereotactic aspiration of a hematoma can be the one of the treatment options for spontaneous intracerebral hemorrhage (SICH) in the basal ganglia. Postoperative hematoma enlargement, however, can be a serious complication of intracranial surgery that frequently results in severe neurological deficit and even death. Therefore, it is important to identify the risk factors of postoperative hematoma growth.

Methods : During a 13-year period, 101 patients underwent minimally invasive stereotactic aspiration for basal ganglia hematoma. Patients were classified into two groups according to whether or not they had postoperative hematoma enlargement in a CT scan. Baseline demographic data and several risk factors, such as hypertension, preoperative hematoma growth, antiplatelet medication, presence of preoperative intraventricular hemorrhage (IVH), were analysed via a univariate statistical study.

Results : Nine of 101 patients (8.9%) showed hematoma enlargement after stereotactic aspiration. Among the various risk factors, preoperative IVH and antiplatelet medication were found to be significantly associated with postoperative enlargement of hematomas.

Conclusion : In conclusion, our study revealed that aspirin use and preoperative IVH are factors associated with hematoma enlargement subsequent to stereotactic aspiration for basal ganglia hematoma. In addition, preoperative IVH was identified as an additional risk factor that influences postoperative hematoma growth and poor outcome.

2-P-22

Factors predicting ventricle volume increase after aneurysmal clipping in patients with subarachnoid hemorrhage

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Objective: While many studies have evaluated risk factors associated with hydrocephalus after aneurysmal subarachnoid hemorrhage, specific ventricle volume changes after subarachnoid hemorrhage have not been evaluated. The objective was to evaluate factors predicting ventricle volume enlargement in patients with aneurysmal subarachnoid hemorrhage by measuring ventricle volume with a validated semi-automated tool.

Methods: Uni- and multivariable linear regression analyses were conducted with the follow-up ventricle volume as the dependent variable, and the duration between subarachnoid hemorrhage occurrence and follow-up imaging as the independent variable, classified using various predictive factors. A logistic regression model was used to calculate the odds ratio for the higher ventricle volume group compared with the lower ventricle volume group based on predictive factors.

Results: We included 173 participants with a mean age of 55.5 years. Overall, an approximate increase in ventricle volume of 1.1 cc was observed daily within 60 days of clipping owing to a subarachnoid hemorrhage. In the multivariate logistic regression analysis, patients in the first and second tertile groups for body mass index showed approximately a 5.9- and 4.1-fold increased risk of higher follow-up ventricle volume, respectively, compared with the third tertile group for body mass index within 60 days of subarachnoid hemorrhage.

Conclusions: We found that higher body mass index independently predicted suppression of ventricle volume growth, owing to maintenance of subarachnoid trabeculae structures after subarachnoid hemorrhage. Further studies are needed to confirm our findings.

2-P-23

The Role of Adiponectin in Secondary Inflammatory Reaction in Cerebral Ischemia

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Objective : In this study, we investigate the role of adiponectin in the interaction between leukocytes and endothelium in the secondary inflammatory reaction of cerebral ischemia

Methods : Adiponectin knock-out mice group (APN-KO) (n=8) and wild-type mice group (WT) (n=8) were prepared. Each group was sub-divided into two groups by reperfusion time. One-hour middle cerebral artery occlusion and reperfusion were induced using the intraluminal filament technique. At 6 and 12 hours after the occlusion, the mice were placed on a stereotactic frame to perform craniotomy in the left parietal area. After craniotomy, a straight pial venule was selected as a target vessel. With the fluorescence intravital microscope, the number of rolling leukocytes and leukocytes that adhered to endothelium were counted and documented at 6 and 12 hours after the reperfusion.

Results : At 6 and 12 hours after the reperfusion, more rolling leukocyte and leukocyte adhesion were observed in the APN-KO mice than in the WT mice. The difference in leukocyte numbers between the APN-KO and WT mice was found to be statistically significant ($P = 0.029$) by Mann-Whitney U-test.

Conclusion : We found that adiponectin inhibits the interaction between the endothelium and leukocytes in cerebral ischemia-reperfusion. Therefore adiponection might prevent the secondary insult caused by the inflammation reaction.

2-P-24

Diagnosis and treatment of intracranial aneurysms in infants

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Objective:To investigate the epidemiological characteristics, clinical manifestations and treatment of intracranial aneurysms in infants.

Methods:To retrospectively analysis medical records of intracranial aneurysm patients in the Department of Neurosurgery, West China Hospital, Sichuan University, who were less than 1 years old and were treated from January 2010 to December 2016, and follow-up.

Results: 6256 intracranial aneurysm patients were treated from January 2010 to December 2016 in Neurosurgery of West China Hospital, Sichuan University, 6 patients of which were less than 1 years .In 6 cases , 5 patients were female, and 1 male, whose average age was 4.7 months (2 -11 months) and average diameter was 1.0cm (0.4-1.5cm). 1 of 6 patients was fusiform and 5 were saccular aneurysms, including 2 cases of pseudoaneurysm. 1of 6 cases showed disturbance of consciousness, 4 cases vomiting. Their average was 60.7 hours (8-144 hours). Except for vertebrobasilar artery aneurysm, all cases underwent craniotomy clipping, and no complications occurred. The mean follow-up time was 21 months (7-68 months), with no aneurysm recurrence or residual, and the GOS score was 4-5.

Conclusion:Infant intracranial aneurysms accounted about 0.1% of intracranial aneurysms and its most common location is middle cerebral artery. Because of lack of specific performance, intracranial aneurysms in infants were often delayed diagnosis. In addition, infants with intracranial aneurysms have a good prognosis after surgical treatment. Therefore, we advocate aggressive surgical treatment for intracranial aneurysms in infants.

2-P-25

POSTERIORLY PROJECTING A-COMA ANEURYSMS: DOME SIDE APPROACH

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Posteriorly projecting A-ComA (anterior communicating artery) aneurysms can cause significant problems to perform complete clipping, due to aneurysm obstructed by the A-ComA complex and its intimate association with perforators when these lesions are approached via dominant A1 side in pterional approach. Asymmetry A2 on the lateral 3D-CT angiogram (3D-CTA) was described as anterior or posterior placed proximal A2, while symmetry A2 as the same proximal A2 plane. The approach from the side where proximal A2 place more anteriorly is known to be more favorable in asymmetry A2 cases. However, there is no any specific report for determining the approach side in symmetry A2 cases that are more common.

The author have operated on posteriorly projecting A-ComA aneurysms via the side of non-dominant A1 segment (dome side approach) in 21 symmetry A2 cases and via the side of anteriorly placed A2 in 10 asymmetry A2 cases. Aneurysm size was mostly below 10mm.

The majority of aneurysms appeared to be extended beneath the A2 and directed to the non-dominant A1 side. Although the aneurysm dome was exposed before its neck with dome side approach in symmetry A2 cases, the recurrent artery of Heubner and the aneurysm dome were not inadvertently violated with subpial dissection. In the surgical field, ipsilateral A2 formed more anteriorly and did not obstruct the view of the aneurysm neck, with elevation of posteriorly located dome by more head rotation to the contralateral side than usual. Careful dissection of the posterior aspect of the A2, perforators, and the aneurysm dome facilitated the mobilization of both A2 segments and the aneurysm. All aneurysms were successfully secured without any surgery related complications.

It is concluded that dome side approach may further improve outcome with easier identification of the aneurysm neck according to proximal A2 plane orientation in posteriorly projecting A-ComA aneurysm based on the 3D-CTA, especially in ruptured cases with experienced hands, irrespective of the choice of the dominant or non-dominant A1 side.

2-P-26

Surgical revascularization for the treatment of complex anterior cerebral artery aneurysms: experience and illustrative review

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Despite of rapid development of surgical skills and endovascular devices, there are still complex aneurysms not eligible to be treated with conventional clipping or coiling. Complex aneurysm on anterior cerebral artery (ACA) is extremely rare, there were only a few case reports and small volume of case series. However, each method is quite different due to the variety on location, relationship with arterial branches, size and morphologic characteristics of aneurysm, or diameter of parent or branching artery.

We investigated complex ACA aneurysm cases based on our own experience and the literatures. There were a total five cases of complex ACA aneurysms (each on case of A1, communicating and A2 segment and two A3 segment aneurysm) requiring to be treated with revascularization in this hospital during recent six years. Each aneurysm characteristics and revascularization method were analyzed and classified.

Side-to-side anastomosis was performed between A3-A3 performed in 3 cases, between A4-A4 in a case and between ipsilateral callosomarginal artery-pericallosal artery in a case. Final Modified Rankin Scale was 0 in 4 cases and 3 in a case. Treatment strategy was classified into six for A1, eight for communicating, seven for A2 and nine for A3 segment aneurysm.

In this series, we treated complex ACA aneurysm successfully by using ACA-ACA side-to-side anastomosis. However, the treatment methods should be tailored according to location and nature of aneurysm and collateral circulation. Preparation with knowledge and practice is crucial for successful treatment outcome for this rare but fatal disease.

2-P-27

Ruptured choroidal artery aneurysms in patients with Moyamoya Disease: Two case series and review of the literatures

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Distal peripheral artery aneurysms in moyamoya disease (MMD) remain difficult to treat given their deep location, small size, and fragility. We report two cases of choroidal artery aneurysms associated with MMD. In the first case, a 22-year-old woman presented with transient left arm weakness after a five-year period of following surgical revascularization for MMD. Digital subtraction angiography (DSA) showed a 4mm-sized aneurysm in anterior choroidal artery. Seven days after, a head computed tomography (CT) showed acute hemorrhage in the right thalamus. Emergent craniectomy with hematoma evacuation and aneurysm clipping was performed, but the patient died of severe brain edema. In the second case, a 33-year-old man complained of headache. A head CT showed acute hemorrhage in the left lateral ventricle, and DSA revealed 3.6mm-sized aneurysm in left posterior choroidal artery with MMD. The aneurysm and the parent artery were embolized successfully without complications. Timing of aneurysm formation remains unclear, however, annual follow-up DSA for surveillance of hemodynamic status is necessary and prompt treatment of aneurysm should be performed when diagnosed. Moreover, choroidal artery aneurysms may benefit from endovascular coil embolization due to their characteristics.

2-P-28

Clazosentan for Aneurysmal Subarachnoid Hemorrhage: A Systematic Review

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Background: Cerebral vasospasm following aneurysmal subarachnoid hemorrhage (aSAH) might elicit delayed ischemic neurological deficit (DIND), and ultimately causes ominous outcome. Due to endothelin's involvement in the pathophysiology of cerebral vasospasm, endothelin receptor antagonist such as clazosentan has been proposed as preventive agent, but uncertainties regarding its effectiveness persist. For this reason, we reviewed the available evidences on clazosentan's efficacies in preventing cerebral vasospasm, reducing mortality risk, reducing delayed ischemic neurological deficit (DIND), and improving functional outcome among aSAH patients.

Method: The method of this study is systematic review. Major online databases (Cochrane Library, PubMed, Science Direct, and EBSCO host) was searched using the following keywords: clazosentan AND subarachnoid hemorrhage. The predefined inclusion criteria were: Randomized Controlled Trials (RCTs) which administered either clazosentan or placebo within the first 72 hours of bleeding onset for a course lasting 14 days, and RCTs which were published in English.

Results: Three out of five included studies saw significant reduction of vasospasm among patients receiving various doses of clazosentan. However, none of the studies reported statistically significant differences between clazosentan and placebo in terms of functional outcome and mortality. Reduction of DIND was seen at higher dose of clazosentan in four of five studies, yet only two studies found this trend significant.

Conclusion: Clazosentan showed benefit in reducing the incident of angiographic vasospasm, but did not translate well to functional outcome improvement, mortality reduction, and DIND reduction. The scarce availability of related studies, and dosage's discrepancy among the available studies, urges the need of further RCTs and dose-finding studies.

Keywords: Clazosentan, aneurysmal subarachnoid hemorrhage, systematic review.

2-P-29

Microsurgical treatment for Rebleeding aneurysms after coil embolization in Ruptured intracranial aneurysms

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Purpose. In spite of the widespread use of endovascular treatment for ruptured intracranial aneurysms concerns about endovascular treatment, such as possibility of incomplete coiling, low long-term durability, and high rebleeding risk, still remain. When these problems occurs microsurgery would be highly important to rescue the problems. The purpose of this study is to assess indications and review technical aspect of microneurosurgery for rebleeding aneurysms after coil embolization in ruptured intracranial aneurysms.

Methods. From January 2002 to June 2017, 457 consecutive patients who presented with aneurysmal subarachnoid hemorrhage were treated with endovascular treatment. Data were collected retrospectively. We have experienced 10 cases of rebleeding after coil embolization in ruptured intracranial aneurysms. Intraprocedural bleeding were excluded. We performed 8 cases of microsurgical clipping. 8 patients showed acuter rebleeding despite of successful embolization in cerebral angiography. 2 patients who showed late rebleeding and aneurysm regrowth.

Results. Incidence of acute rebleeding after successful coil embolization of ruptured aneurysm was 1.7% (8/457). 6 acute rebleeding were clipped without coil removal. Based of operative findings we suspect that the thrombus in the coils in the aneurysms at the time of coiling would be resolved and the bleeding point was aneurysm neck site. In the late rebleeding 2 cases one was a giant aneurysm who was coiled another hospital and rebleeding from a large aneurysm all were developed due to aneurysm regrowth. The coil mass was removed and clipping was done. In this case long temporary clip time and migration of the thrombus and clipping difficulty due to atherosclerosis and coil in the neck were the problems. Aneurysm locations were A-com (N=6), P-com (n=2), and distal ACA (n=2). The initial size ranged from 3.7 mm -25.6 mm. The aspect ratio ranged from 0.77-3.12. EVD was done in 7 patients in acute rebleeding patients. Postcoiling tirofiban was used in 2 patients and fraxiparin was used in 5 patients.

Conclusions. Rebleeding is rare but the morbidity and mortality is high. The clipping of the aneurysm neck is difficult because of the coils are localized within the neck region. Microsurgical treatment remains a viable option for treating rebleeding aneurysms previously coiled.

2-P-30

Applicability of predictive model for management of poor grade subarachnoid haemorrhage- a study of 94 patients with 6 months follow up.

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Poor grade subarachnoid haemorrhage patients (WFNS 4-5) represent a unique cohort with lack of clear treatment protocol. A small but significant subset of these patients can have a good outcome(GOS 4-5). Recent paper by Szklener has come up with a predictive scale in this subgroup of patients that were managed conservatively. We wanted to check the validity of this scale in our patient population (both surgical and conservative management) and see if this scale can be used to guide early patient transfer and aggressive management at the Neurosurgical unit with judicious use of resources.

We performed a retrospective review of neurosurgical referral database and clinical data at our centre over 2 year period. Patients with poor-grade aneurysmal SAH were included in the study with follow up period of 6 months. Demographic information, Fisher and WFNS scores, admitting leucocyte count and outcome information as per MRS were obtained. These were scored as per the scale suggested by Szklener.

A total of 94 poor grade subarachnoid patients were referred over the study time frame of which 30 patients were accepted for admission to Neurosurgery ITU. 20 patients had a good outcome of which 2 had been managed conservatively in the referring hospitals.

The suggested scale seems to well predict the likelihood of poor outcome in both surgically and conservatively managed patients with poor grade subarachnoid haemorrhage. It can serve as a potential aid in decision making while providing optimum treatment with limited resources.

2-P-31

Poster presentation

Increased ratio of superficial temporal artery flow rate after superficial temporal artery-to-middle cerebral artery anastomosis: Can it reflect the extent of collateral flow?

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Objective: There are several ways to identify donor artery patency and success of surgery after an anastomosis of the superficial temporal artery (STA) to the middle cerebral artery (MCA). The purpose of this study was to evaluate the ratio of bilateral STA mean flow rate (MFR) using color Doppler ultrasonography (CDUS) after bypass surgery and to confirm the possibility of this value as a predictor of the extent of collateral flow.

Methods: Eleven consecutive patients who had undergone STA-MCA anastomosis were included. In every case, bilateral STA MFR, mean velocity (MV), and cross sectional diameter (CSD) were measured preoperatively and postoperatively at 1 week, 1 month, and 2 months using CDUS. We measured the bilateral STA MFR ratio changes to compensate for systemic hemodynamic variables.

Results: One month after surgery, nine of the 11 patients who underwent STA-MCA anastomosis had good patency on DSA. In patients with good patency, there was a significant increase in the baseline STA MFR ratio compared to those at 1 week, 1 month, and 2 months postoperatively (2.88, 3.07 and 4.38, respectively, $P < 0.05$). The mean STA CSD ratio was also significantly increased postoperatively in the good patency group (1.35, 1.41 and 1.49, respectively, $P = 0.044$). In addition, the mean STA MV ratio was increased postoperatively in the good patency group (1.48, 1.40 and 1.67, respectively, $P = 0.042$).

Conclusions: We conclude that using CDUS to measure both STA MFR ratio is a potentially useful method for predicting the extent of collateral flow through an STA-MCA anastomosis.

2-P-32

The assessment of blood flow in the supratrochlear artery to determine the surgical treatment strategy in patients with ICA occlusion.

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Objective: to estimate hemodynamic changes after cerebral revascularization in patients with occlusion and critical stenosis of internal carotid artery (ICA).

Material and methods. 52 patients (men: women = 3:1, age from 40 to 78 years old (Me=65.6)) suffered from occlusive-stenotic diseases of ICA were operated on from 01.01.2017 till 31.03.2017 in neurosurgical department of Scientific Research Institute of Emergency Care n.a. N.V. Sklifosovskiy, among them 37 patients underwent carotid endarterectomies (CEE), 9 – bypass between superficial temporal artery and cortical branch of middle cerebral artery (STA-MCA bypass).

Dopplerography of supratrochlear artery (StrA) with estimation of linear blood velocity and direction of blood flow was performed in 2 patients with symptomatic critical stenosis of ICA (also they had asymptomatic occlusion of contralateral ICA) and in 4 patients with symptomatic ICA occlusion. All patients (n=6) had retrograde blood flow in StrA preoperatively. The significant preoperative decrease of cerebral perfusion in ipsilateral cerebral hemisphere till $21 \pm 2,6$ ml/min/100g was observed in all patients, one patient with ICA occlusion had perfusion steal syndrome. Patients' status was assessed using NIHSS, modified Rankin scale (mRs) and Rivermead mobility index.

Results. There were no ischemic complications in postoperative period and no lethal outcomes. The change of blood flow direction in StrA from retrograde to anterograde was observed in 5 patients in early postoperative period. Postoperative single-photon emission computerized tomography (SPECT) showed the increase of cerebral perfusion on $13 \pm 1,2$ ml/min/100g ($22 \pm 4,8\%$) as well as neurological status improved in average on 1,2 scores according to NIHSS, 0,3 scores by mRs and 2,1 scores by Rivermead mobility index in all patients before discharge.

Conclusion: The direction of blood flow in StrA may evident the insufficient cerebrovascular reserve in patients with critical stenosis or occlusion of ICA and consequently indicate the necessity of revascularization surgery.

2-P-33

Risk Factors for Newly-Developed Cerebral Infarction after Surgical Revascularization for Adults with Moyamoya Disease

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Objective

It is important to recognize the incidence and risk factors for ischemic complications after surgical revascularization for moyamoya disease (MMD). However, most studies focus on pediatric MMD or both pediatric and adult MMD. Our study identified the incidence and risk factors of newly-developed cerebral infarction after surgical revascularization for adult MMD.

Methods

Ischemic complications were defined as newly-developed cerebral infarction within 15 days following surgery, as identified by imaging studies. To identify the incidence and these risk factors for adult patients 18 years or older, we retrospectively reviewed our experience with 194 adult MMD patients with 241 surgical revascularizations.

Results

The incidence of symptomatic infarction after surgical revascularization was 5.8% (14 cases); 30 cases (12.4%) experienced a silent infarction. In univariate analysis, initial presentation as infarction, initial presentation as hemorrhage, transient ischemic attacks (TIAs) >3 times/month, involvement of the posterior cerebral artery (PCA), combined bypass, and using muscle for revascularization were variables related to the newly-developed cerebral infarction. Multivariate analysis revealed that the following factors were independently associated with newly-developed cerebral infarction after surgery: cerebral infarction as initial presentation (OR 1.150; 95% CI 1.038-1.273; $p=0.0073$), TIAs>3times/month (OR 1.188; 95% CI 1.058-1.335; $p=0.0035$) and PCA involvement (OR 1.095; 95% CI 1.005-1.194; $p=0.039$).

Conclusions

Our findings demonstrate that newly-developed, silent cerebral infarction developed more frequently than symptomatic cerebral infarction in adult patients. Cerebral infarction as initial presentation, frequent TIA before surgery, and PCA involvement were also independent risk factors for newly-developed cerebral infarction following surgical revascularization for adult MMD.

2-P-34

Middle Cerebral Artery Dissection Causing Recurrent Ischemic Symptoms in a Young Rugby Player

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Background: There have been few reports of pediatric middle cerebral artery (MCA) spontaneous dissection in the literature. We describe the first case of symptomatic recurrent MCA dissection in a young rugby player who was treated by intravenous recombinant tissue-plasminogen activator (rt-PA) and endovascular therapy (EVT).

Clinical Presentation: A 13-year-old boy presented with a sudden onset of left temporal headache and right hemiparesis following rugby practice. On admission neurological exam revealed mild consciousness disturbance and right hemiparesis (MMT3/5) with NIHSS 15, GCS 14 (E4V4M6). The patient was afebrile and standardized thrombophilia evaluations, electrocardiograph, echocardiography were unremarkable. Magnetic resonance angiography (MRA) showed left M1 occlusion and because diffusion-weighted imaging (DWI) showed left frontal hemisphere infarction (ASPECTS-DWI score 9) indicative of clinical DWI mismatch, he was treated with intravenous rt-PA followed by endovascular recanalization therapy. The presence of dissection was unclear and recanalization (TICI 2b) with almost full clinical recovery (NIHSS 0) was achieved. However one week later, he suffered two episodes of transient right hemiparesis, and digital subtraction angiography (DSA) revealed left internal carotid (ICA) and M1 stenosis, which was treated by intra-arterial Fasudil with partial symptomatic recovery. The following day recurrence of right hemiparesis and restenosis was treated by endovascular percutaneous transluminal angioplasty (PTA) and stent placement (Enterprise) with almost complete recovery of motor weakness on discharge (mRS1, GOS: good recovery). During the 12 month outpatient follow-up period with oral cilostazol (200mg) there was no radiographic (M1 distal stenosis unchanged) or clinical worsening.

Conclusion: Stroke in the pediatric population is uncommon. The etiology of stroke in this case is difficult to definitively determine, however traumatic or spontaneous dissection in the MCA causing distal embolism is the most likely explanation. Cerebral vasoconstriction syndrome is another possible cause of his symptoms. In addition to endovascular treatment, surgical trapping with anastomosis (MCA-STA) is an option for arterial dissection, however in this case EVT was chosen and the fluctuating symptoms resolved. Although long-term follow-up is necessary, this case demonstrates that EVT can be safe and effective.

2-P-35

Novel Hybrid Operating Table for Neurovascular Treatment

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Background: The integration of interventional and surgical techniques is requiring the development of a new working environment equipped for the needs of an interdisciplinary neurovascular team. However, conventional surgical and interventional tables have only a limited ability to provide for these needs. We have developed a concept mobile hybrid operating table that provides the ability for such a team to conduct both endovascular and surgical procedures in a single session.

Methods: We developed methods that provide surgeons with angiography-guided surgery techniques for use in a conventional operating room environment. In order to design a convenient device ideal for practical use, we consulted with mechanical engineers.

Results: The mobile hybrid operating table consists of two modules: a floating tabletop and a mobile module. In brief, the basic principle of the mobile hybrid operating table is as follows: firstly, the length of the mobile hybrid operating table is longer than that of a conventional surgical table and yet shorter than a conventional interventional table. It was designed with the goal of exhaustively meeting the intensive requirements of both endovascular and surgical procedures. Its mobile module allows for the floating tabletop to be moved quickly and precisely. It is important that during a procedure, a patient can be moved without being repositioned, particularly with a catheter in situ. Secondly, a slim-profile headrest facilitates the mounting of a radiolucent head cramp system for cranial stabilization and fixation.

Conclusion: We have introduced a novel invention, a mobile hybrid operating table for use in an operating suite.

2-P-36

Withdrawn

2-P-37

Management strategies in Large and Giant Intracranial aneurysms – Experience from a tertiary referral center

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Objectives:

To review our experience in the management strategies and outcomes of large and giant intracranial aneurysms.

Methods:

This retrospective study was performed on all patients with large (1.5-2.5 cm) and giant intracranial aneurysms (>2.5 cm) who were managed at NIMHANS from 2006 to 2016. Data was obtained from the hospital records. Assessment of patients was done based on telephonic questionnaires or by hospital records. The statistical analysis was performed as required.

Results:

They constituted 11.4% (Large – 7.2 and Giant aneurysms 4.2%) of the total aneurysms. Surgery as well as endovascular management carried good outcome in all the patients with infraclinoid ICA aneurysms. Supraclinoid ICA aneurysms managed with surgery had a good outcome in 77.8% with an overall morbidity and mortality of 18.4% and 13.2% respectively. There were no significant differences in the outcomes of either clipping or coiling. ACA and MCA territory aneurysms managed by surgery had a good outcome of 83% and 75% respectively. In posterior circulation aneurysms, surgery had a poorer outcome with good outcome in 50% while endovascular management carried a good outcome in 88.9%. On multivariate analysis factors, various factors such as age, sex, size, presentation (ruptured/ unruptured), Fischer grade and WFNS grade did not have a statistically significant influence on outcome.

Conclusion:

Surgery and endovascular management are complementary methods for management of infraclinoid and supraclinoid ICA aneurysms while ACA and MCA aneurysms were preferentially managed by surgery due to various factors. Endovascular management is the preferred strategy for posterior circulation large and giant aneurysms.

2-P-38

Outcome of superficial temporal artery to middle cerebral artery bypass in acute period of cerebral infarction

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PURPOSE : Superficial temporal artery to middle cerebral artery (STA-MCA) anastomosis had been performed for the prevention of secondary stroke in selected cases at chronic stage. But there is a little evidence about the effect of surgery. The authors performed urgent STA-MCA anastomosis in acute period for the patients who was in progressive stroke or failed to fibrinolytic therapy. We investigated the effect of bypass surgery in acute period and good prognostic factors with retrospective cohort study.

MATERIALS AND METHODS : The patients who presented with major vessel occlusion and underwent emergency STA-MCA anastomosis were enrolled in this study for 9 years. Total 83 patients enrolled in this study. Diffusion/perfusion Magnetic Resonance Image (MRI) and catheter angiography findings are major determinants of decision making of surgery. Only the patient who had small volume of infarction (less than 30cc) and large volume of perfusion defect with MRI study was selected as a surgery candidate. Favorable factors for good prognosis were investigated about radiologic findings, neurologic status, surgery timing.

RESULTS : Mean age was 59 and male female ratio was 29:12. Initial national institute of health stroke scale (NIHSS) was 2 to 22. Mean volume of infarction was 8.3cc (1 to 40 cc) and mean time to peak (TTP) delay area volume was 75cc. NIHSS was higher in perforator infarction group (9.4 vs 3.6). Median surgery interval from ictus to reperfusion was one day (0 to 8 day). There was no case of post-operation intracerebral hemorrhage or mortality. Post operative perfusion MRI at 1 week revealed full recovery of TTP delay in almost cases. Surgical outcomes according to modified Rankin score (mRS) are as follow (IV:9,III:11,II:19,I:18,0:27)

CONCLUSION : Urgent STA-MCA anastomosis showed good outcome in acute period of infarction. Small infarction volume in the watershed area with large perfusion defect can be a good candidate for bypass surgery. It can improve the blood flow in critical area with little risk of reperfusion injury because of low flow characteristics. Bypass surgery in acute period of infarction can be a good option because it has a considerable long time window.

2-P-39

The surgical Approach for the High Cervical Internal Carotid Artery Stenosis in Carotid Endarterectomy -manipulate dislocation of temporomandibular joint-

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【Objectives】

I present the surgical Approach for the High Cervical Internal Carotid Artery Stenosis in Carotid Endarterectomy
The High Cervical Internal Carotid Artery Stenosis is: 1 to do preparation of high cervical lesion 2. to do dislocation of lower jaw

【Material Methods】

We operated on two cases made lower jaw dislocate of 184 patients (average 71y) case 1 : 69y M. Lesion C1.

case 2 : 79y M. Lesion C1

We explain the strategy of high cervical CEA ① Posture ② The treatment of parotid gland ③ After having anesthetized it, we make lower jaw dislocate

【Results】

We present the method of dislocation of temporomandibular joint and the advantage of a dislocation of temporomandibular joint in CEA on a video.

【Conclusion】

We present the surgical Approach for the High Cervical Internal Carotid Artery Stenosis in Carotid Endarterectomy.
We move lower jaw until we can see internal carotid petrous part enough in the distal part of the internal carotid narrow segment at the C1 level.

2-P-40

Withdrawn

2-P-41

Multiple saccular aneurysms from left internal carotid artery : A case report and lesson learnt

○ Ishu Bishnoi

Multiple aneurysms are found in approximately 20-25% cases of total aneurysm cases. The well-known risk factors are female, smoking, hypertension and old age. There are very few case reports in literature, which had reported about multiple aneurysms arising from single artery and its management. Due to lack of data, not much is known about pathology and standard treatment of such case. Most favoured treatment, as reported in literature, is endovascular coiling with/without stenting. Another treatment modality is combined surgical and endovascular. We are reporting about management of a rare case, who had four aneurysms arising from single artery i.e. left Internal carotid artery, and review the literature.

2-P-42

Complete dissection of the sylvian fissure stem according to the morphological feature of the orbital gyrus and the planum polare of the temporal lobe

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Background: The deep cisternal part of the sylvian fissure stem is more complex. More developed and large posterior and lateral orbital gyri (OG) make the dissection of that part more difficult, because adhesion between the OG and the planum polare (PP) becomes more tight and extensive in such a case. The purpose of this presentation is to evaluate the degree of the sylvian fissure stem's adhesion and investigate the morphological feature of the OG and the corresponding PP in trans-sylvian approach. **Methods:** Firstly, we retrospectively classified fifty-four patients, who underwent clipping of anterior circulation aneurysms via the trans-sylvian approach at our institution, in three types (Type A:difficult, Type B:normal, Type C:easy) according to the degree of difficulty of the sylvian fissure stem's dissection by the operative videos. Secondly we investigated the size of the OG and the degree of adhesion between the OG and each surface of the PP which were classified in three surfaces(lateral, anterior and medial surface) morphologically. **Results:** 16 cases were Type A, in which adhesion between the OG and the PP was more tight and extensive, so we needed to start to dissect the sylvian fissure from more distal portion in order to dissect the stem completely. 14 cases were Type B, in which adhesion between the OG and the PP was not so tight and partially. 24 cases were Type C, in which adhesion between the OG and the PP was little, so we could get the complete dissection of the stem easily. **Conclusion:** Morphological feature of the OG and the PP is very important factor to determine the degree of difficulty of the sylvian fissure stem's dissection in trans-sylvian approach.