Intraoperative use of motor/sensory evoked potential monitoring in the clipping of intracranial aneurysms

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Somatosensory and motor evoked potentials (SEPs and MEPs) are often used to prevent ischemic complications during aneurysm surgeries. However, surgeons often encounter cases with suspicious false-positive and false-negative results from intra-operative evoked potential (EP) monitoring, but the incidence and possible causes for these results are not well established. The aim of this study was to investigate the efficacy and reliability of EP monitoring in the microsurgical treatment of intracranial aneurysms by evaluating false-positive and false-negative cases. From January 2012 to April 2016, 1514 patients underwent surgery for unruptured intracranial aneurysms (UIAs) with EP monitoring at the authors’ institution. An EP amplitude decrease of 50% or greater compared with the baseline amplitude was defined as a significant EP change. Correlations between immediate postoperative motor weakness and EP monitoring results were retrospectively reviewed. Eighteen (1.19%) of the 1514 patients had a symptomatic infarction, and 4 (0.26%) had a symptomatic hemorrhage. A total of 15 patients showed motor weakness, with the weakness detected on the immediate postoperative motor function test in 10 of these cases. Fifteen false-positive cases (0.99%) and 8 false-negative cases (0.53%) were reported. Therefore, MEP during UIA surgery resulted in a sensitivity of 0.10, specificity of 0.94, positive predictive value of 0.01, and negative predictive value of 0.99. Intraoperative EP monitoring has high specificity and negative predictive value. Both false-positive and false-negative findings were present.
The use of stent-retrievers to treat recurrent delayed cerebral vasospasm secondary to aneurysmal subarachnoid hemorrhage - a single center experience

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Purpose
We report our experience of using stent-retrievers for recurrent cerebral vasospasm (CVS) secondary to aneurysmal subarachnoid hemorrhage (aSAH).

Methods
We performed a retrospective review of our prospectively maintained institutional database to identify all patients with recurrent CVS and treated with stent-retrievers between April 2011 and May 2017. All patients were initially treated with IA vasodilators and were subsequently re-treated with stent-retrievers if they developed recurrent vasospasm. Patients were categorized into two groups, those in which IA vasodilators were given again prior to the stent-retriever deployment (VD-first) and those in which the stent-retriever was deployed first and IA vasodilators were given subsequently (SR-first).

Results
We identified 12 patients (7 females, mean age 54.9), 5 in the VD-first and 7 in the SR-first cohorts. Stent-retriever lumen dilatation was attempted in 53 segments (VD-first - 14, SR-first - 39). Stent-retriever deployment was technically feasible in all cases. Vasodilation occurred in 71.4% (10/14 segments) in the VD-first group and 82.1% (32/39 segments) in SR-first group. Additional treatments were required in 5 segments. There was no recurrent vasospasm in the SR-first group however, 3 patients (60%) in the VD-first group showed recurrent vasospasm. No angiographical abnormality was found at long-term follow-up (7 patients, mean 29.1 months).

Conclusions
The use of stent-retrievers to treat cerebral vasospasm is technically feasible and can cause long-term vasodilatation, however this effect is maximized if stent-retrievers are used prior to infusion of IA vasodilators.
Feasibility and Safety of Mild Therapeutic Hypothermia in Poor-Grade Subarachnoid Hemorrhage: a Prospective Pilot Study

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Therapeutic hypothermia (TH) improves the neurological outcome in patients after cardiac arrest and neonatal hypoxic brain injury. We studied the safety and feasibility of mild TH in patients with poor-grade subarachnoid hemorrhage (SAH) after successful treatment. Patients were allocated randomly to either the TH group (34.5°C) or control group after successful clipping or coil embolization. Eleven patients received TH for 48 h followed by 48 h of slow rewarming. Vasospasm, delayed cerebral ischemia, functional outcome, mortality, and safety profiles were compared between groups. We enrolled 22 patients with poor-grade SAH (Hunt & Hess Scale 4-5 and modified Fisher Scale 3-4). In the TH group, 10 of 11 (90.9%) patients had a core body temperature of < 36°C for > 95% of the 48-h treatment period. Fewer patients in the TH than control group (n=11 each) had symptomatic vasospasms (18.1% versus 36.4%, respectively) and delayed cerebral ischemia (36.3% versus 45.6%, respectively), but these differences were not statistically significant. At 3 months, 54.5% of the TH group had a good-to-moderate functional outcome (0-3 on the modified Rankin Scale) compared with 9.0% in the control group (P = 0.089). Mortality at 1 month was 36.3% in the control group compared with 0.0% in the TH group (P = 0.090). Mild TH is feasible and can be safely used in patients with poor-grade SAH. Additionally, it may reduce the risk of vasospasm and delayed cerebral ischemia, improving the functional outcomes and reducing mortality. A larger randomized controlled trial should be warranted.
FPI-4

Early coagulation, inflammation and acute brain injury after a subarachnoid hemorrhage

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Background: Although acute pathological mechanisms after subarachnoid hemorrhage (SAH) remained obscure, these resulted in early brain injury (EBI) and delayed cerebral ischemia (DCI) which had a major impact on the outcome of patients with SAH. Serum biomarkers, such as C reactive protein (CRP), white blood cell (WBC), D-dimer, Stress index (SI; blood sugar/ K ratio) were easy to obtain and measure and can be a predictor for SAH. Moreover, SAH can trigger immune activation sufficient to introduce the systematic inflammatory response syndrome (SIRS), and several investigators reported that SIRS can predict a poor outcome. We sought to evaluate whether the initial serum biomarkers and SIRS score were associated with EBI and poor outcome in SAH.

Methods: This study included 75 patients hospitalized within 24 hours from onset for non-traumatic SAH. A SIRS score was derived by summing the number of variables meeting standard criteria (HR>90, RR>2038°C or 12000). MRI were underwent within 0-7 days from onset to detect EBI.

Results: WBC, SI, D-dimer, and SIRS scores were associated with WFNS grade. SI and SIRS score was associated with poor outcomes. EBI were detected in 21 patients (28.0%). Patients with EBI had significantly higher D-dimer than patients without no EBI (10.8±10.6 vs. 4.2±5.7).

Conclusion: This study suggested that SI, and SIRS score predicted for poor outcome in patients with SAH, and that EBI was associated high D-dimer. Further investigation is needed to confirm whether controlling neuroinflammation and suppression of hyper-coagulation can lead to good outcome.
FPI-5

Preoperative findings anticipate poor grade subarachnoid hemorrhage and prognostic factors; Retrospective study

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Objective
To reveal factors which can anticipate the poor grade subarachnoid hemorrhage (SAH) and analyze the preoperative prognostic factor.

Methods
186 patients were included. Physiological, radiographic and blood examination data were collected retrospectively. Factors related to poor WFNS grade and poor outcome were analyzed. Poor outcome was defined as modified Rankin scale scores 3-6. All surgical intervention were performed by clipping immediately after diagnosis of SAH. 10 cases were treated conservatively because of no bilateral light reflex.

Results
Mean age was 61.6 years. Female sex was in 134(72%). Poor WFNS were observed in 70(46.2%). Poor WFNS were significantly(P=0.005) correlated to Age≧70 (p=0.007; adjusted odds ratio(OR): 3.732), midline shift (p=0.003; OR: 4.894), no CSF in high convexity cortical sulcus (p=0.001; OR: 5.471), and ambient cistern (p=0.003; OR: 4.830). Poor outcome were significantly correlated to Age≧70 (p<0.001; OR: 8.363), WFNS grade5 (p<0.001; OR: 15.350), ICH (p=0.014; OR: 3.323), Evans index(EI)≧0.3 (p=0.008; OR: 4.398). EI≧0.3 were significantly correlated to body mass index (p=0.046; OR: 0.865), intraventricular hemorrhage (p=0.008; OR: 3.859), HbA1c (p=0.008; OR: 2.781) and Age≧70 (p=0.003; OR: 4.115).

Conclusion
Present study shows that the radiographic signs of poor grade SAH were not correlated to poor outcome. The results suggest that early decompressive surgery may improve outcome. Poor outcome were correlated to high-age, brain-destructive hemorrhage and EI≧0.3. And EI reflects not only hydrocephalus but also patient’s frailty. Surgical indication for the patients with those aging related status may be controversial.
The association of intracranial arterial tortuosity and the Characteristics of Intracranial Aneurysms

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Background and Purpose: Intracranial aneurysm (IA) is the leading cause of hemorrhagic stroke. The pathomechanisms of IA are poorly understood but can be related to arterial tortuosity resulting from underlying systemic factors leading to arterial wall weakening. We aimed to analyze the tortuosity of the intracranial artery in an IA cohort, hypothesizing that the tortuosity of intracranial arteries will differ depending on the characteristics of the IA.

Methods: Patients with saccular IA were consecutively enrolled. Clinical factors and vascular tortuosity of the right and left MCAs and BA of all patients with IA were compared according to the characteristics of the IA: 1) ruptured vs. unruptured, 2) multiple vs. single, and 3) large (>5 cm) vs. small (≤5 cm).

Unruptured IAs were comparatively analyzed according to aneurysm size and aspect ratio (AR), while ruptured IAs were analyzed according to aneurysm size.

Results: Two hundred eighty-five patients were enrolled (mean age, 59 years; 71.2% women). The tortuosity of the BA was higher in the large IA group (5.63±6.26; n=133; p=0.009), large unruptured IA group (6.64±6.32; n=53; p=0.039), and large ruptured IA group (5.50±6.52; n=80; p=0.033) compared with the small IA, small unruptured IA, and small ruptured IA group. In multivariate analysis, increased BA tortuosity was significantly associated with large IAs (s=1.066; p=0.008), unruptured large IAs (s=1.077; p=0.033) and ruptured large IAs (s=1.086; p=0.025).

Conclusion: The BA tortuosity was higher in patients with large IAs, which may represent an imaging biomarker of aneurysm growth.
Intracranial aneurysms in young adults: Characteristics of the twenties and thirties patients

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Objective: The intracranial aneurysms that occur in young adults are rare and their characteristics are not well known. The purpose of this study was to investigate the characteristics of the aneurysms of the patients in their twenties and thirties and the specific independent risk factors for rupture. Methods: We retrospectively collected data for the patients aged 20 to 39 years with a ruptured or unruptured intracranial aneurysm, from January 2000 to December 2015. We included 330 patients with 389 aneurysms not associated with arteriovenous malformation or dural arteriovenous fistula. Results: Of the 330 patients, 51.8% were male and 41.5% were found to be ruptured aneurysm. Most aneurysms were in the internal carotid arteries (47.0%). The mean (+-SD) size of aneurysms was 7.5+-6.9 mm in their twenties and 5.8+-5.1 mm in their thirties (p = 0.02). In the twenties group, the ratio of male, SAH, and fusiform/dissecting aneurysm was higher than in their 30s. The risk of rupture increased with increasing size of the aneurysm. With aneurysms that were less than 5mm in size as the reference, the odds ratio for size categories were as follows: 5 to 10mm, 5.61 (95% CI: 3.44 to 9.13, p<0.001); and larger than 10mm, 2.84 (95% CI: 1.45 to 5.53, p <0.001). Conclusion: The characteristics of the intracranial aneurysms in young adults are similar to those of children, especially in their twenties. According to the size and location of the aneurysm, the risk of rupture varied.