A summary of some of the recently published, seminal papers in neuroscience

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The authors investigated whether bracing after posterior spinal instrumented fusion (PSIF) can improve pain relief and quality of life (QoL) 6 weeks and 3 months postoperatively. There were 25 patients in the brace group and 18 patients in the control group with similar baseline characteristics. The Oswestry’s Disability Index (ODI), Short form (SF)-12v2, and Visual Analog Scale (VAS) for back pain improved in comparison to the preoperative scores. The improvement was significant at a 3-month follow-up when assessed by the ODI and VAS for both the groups, and significant only for the control group when assessed by the SF-12v2 scores. The improvements in ODI, SF-12v2, and VAS were significantly greater for the control group at 3 months postoperatively. Moreover, a larger proportion of patients in the control group reached minimum clinically important difference as compared to the brace group at 6 weeks and 3 months. Hence, the authors concluded that postoperative bracing did not result in better improvement in the QoL or pain relief up to 3 months after PSIF in these patients.


Uncoforaminotomy/uncal resection (UR), performed along with ACDF, facilitates better and faster improvement of arm pain. The authors examined 167 patients who consecutively

underwent single- or double-level ACDF and were followed for >2 years. UR was not performed in 46 patients (Non-uncinate resection [N-UR] group). UR of at least one foramen was performed in 121 patients (UR group), including unilateral UR in 89 patients (U-UR group) and bilateral UR in 32 patients (B-UR group). There was no difference in sex, age, weight, height, body mass index, and a history of smoking between the N-UR and UR groups. The fusion rates after a single-level ACDF were not significantly different among the N-UR, U-UR, and B-UR groups (91.4%, 97.8%, and 88.2%). The improvement in the VAS score for arm pain was significantly better in the UR group than in the N-UR group at a short-term follow-up. The authors concluded that unilateral or bilateral UR does not affect the fusion rate after single- or double-level ACDF.

Contributed by Dr. Mazda K Turel


The study was designed as a double-blind randomized controlled trial. 325 patients with a symptomatic lumbar disc herniation were randomly allocated to tubular discectomy (166 patients) or conventional microdiscectomy (159 patients). There was no clinically significant difference between tubular discectomy and conventional microdiscectomy regarding the main clinical outcomes at any time point during the 5 years of follow-up. Mean differences for leg pain and back pain were 0.2 and 0.4, respectively. 77% of patients allocated to conventional discectomy reported complete or near-complete recovery of symptoms compared with 74% of patients allocated to tubular discectomy. The reoperation rate was 18% in the tubular discectomy group and 13% in the conventional discectomy group. Long-term functional and clinical outcome did not differ between patients allocated to tubular discectomy and conventional microdiscectomy.

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In this systematic review and meta-analysis, the authors independently searched 13 databases for randomized controlled trials comparing the use of atraumatic needles and conventional needles for any lumbar puncture indication. A total of 31,412 participants were eligible for analysis. The incidence of postdural-puncture headache was significantly reduced from 11% in the conventional needle group to 4% in the atraumatic group. Atraumatic needles were also associated with significant reductions in the need for intravenous fluid or controlled analgesia, need for an epidural blood patch, any headache, nerve root irritation, and hearing disturbance. Success of lumbar puncture on the first attempt, failure rate, mean number of attempts, and the incidence of traumatic tap and backache did not differ significantly between the two needle groups. These results were rated as high-quality evidence when examined using the grading of recommendations assessment, development, and evaluation.

Contributed by Dr. Mazda K Turel


Spinal metastases are becoming increasingly more common because patients with metastatic disease are living longer. The close proximity of the spinal cord to the vertebral column limits many conventional therapeutic options that can otherwise be used to treat cancer. In response to this problem, an innovative multidisciplinary approach has been developed for the management of spinal metastases, leveraging the capabilities of image-guided stereotactic radiosurgery, separation surgery, vertebroplasty, and minimally invasive local ablative approaches. In this review, the authors discuss the variables that should be considered during the management of these patients and review the role of each discipline and their respective management options to provide optimal care. This work is synthesised into a practical algorithm to aid clinicians in the management of patients with spinal metastasis.

Contributed by Dr. Mazda K Turel


This systematic review aims to summarize important clinical predictors of outcomes in patients undergoing surgery for the treatment of degenerative cervical myelopathy. Based on the results of this article, patients with a longer duration of symptoms and more severe myelopathy are likely to have worse surgical outcomes. With respect to age, several studies have indicated that elderly patients are less likely to translate neurologic recovery into functional improvements. However, many other studies have failed to identify a significant association between age and outcomes. Finally, smoking status and presence of comorbidities may be important predictors of outcomes.

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The authors conducted a randomized trial to investigate whether tumor treating (TT) fields [low-intensity electric fields alternating at an intermediate frequency (200kHz), aiming to disrupt cell division and organelle assembly] improves progression-free and overall survival of patients with a glioblastoma. In this study, patients were randomized 2:1 to TT...
fields plus maintenance temozolomide chemotherapy \((n = 466)\), or to temozolomide alone \((n = 229)\). Of the 695 randomized patients, 637 (92%) completed the trial. Median progression-free survival was 6.7 months in the TT fields-temozolomide group and 4 months in the temozolomide-alone group \((P < 0.001)\). The median overall survival was 21 months in the TT fields-temozolomide group vs 16 months in the temozolomide-alone group \((P < 0.001)\). The frequency of systemic adverse event was 48% in the TT fields-temozolomide group and 44% in the temozolomide-alone group. The authors concluded that the addition of TT fields to maintenance temozolomide chemotherapy vs maintenance temozolomide alone resulted in statistically significant improvement in progression-free survival and overall survival.

**Contributed by Dr. Mazda K Turel**


Few studies have compared transsphenoidal endoscopic (TE) and transsphenoidal microscopic (TM) techniques for the treatment of craniopharyngiomas. The authors performed a systematic review of published series. A total of 1,186 patients met the inclusion criteria. Overall, 60% of endoscopic cases were supradiaphragmatic, and 76% of microsurgical cases were infradiaphragmatic. The mean tumor size was 3 cm and 2.4 cm in the TE and TM series, respectively. Total resection rate was similar (66%) between TE and TM. Recurrence rate was higher in the endoscopic series (21.7% versus 12%). Mortality and the overall complication rates were similar. However, hydrocephalus (7.6%) and cognitive dysfunction (15.8%) were more common in TE, and meningitis (6%) and endocrinologic complications were more common in the TM series. In the past 6 years, the rate of cerebrospinal fluid leak in TE was significantly lower (13%) and was comparable between the TE and TM techniques. They concluded that both techniques appear comparable for infradiaphragmatic lesions; however, TE seems to yield better results for supradiaphragmatic tumors.

**Contributed by Dr. Mazda K Turel**


The main aim of this study was to identify which patients with a glioblastoma multiforme (GBM) have a higher risk of presenting with seizures during the follow-up period. Patients with newly diagnosed GBM were reviewed \((n = 306)\) and classified as patients with (Group 1) and without (Group 2) seizures at onset. Group 2 was split into patients with seizures during the follow-up period (Group 2A) and patients who never had seizures (Group 2B). In patients with a GBM who had no seizures at onset, an increased risk of presenting with seizures during the follow-up period was identified in patients who had their tumor at the superior frontal and inferior occipital lobes, as well as in the inferoanterior regions of the temporal lobe. Conversely, those patients with the GBM located in the medial and the inferoanterior temporal areas had a significantly lower risk of suffering from seizures during the follow-up period. These results may help to support the use of antiepileptic prophylaxis in a selected GBM population and to improve stratification in antiepileptic clinical trials.

**Contributed by Dr. Mazda K Turel**


Cavernous malformations (CMs) are uncommon lesions occurring in the central nervous system. Among CMs, prevalence within the brainstem, as reported in the literature, has ranged from 4 to 35%. Although the outcomes reported in the literature have been satisfying, surgical intervention has become increasingly contraindicated. This is because of the tendency for a benign clinical course in brainstem CMs, after weighing this fact against the high risk of surgical morbidity. Thus, it is advisable to operate on patients with symptomatic lesions abutting the pial or ependymal surface of the brainstem or where lesions are accessible to “safe entry zones”, which have caused more than one significantly symptomatic haemorrhage and can be defined as being aggressive. However, treatment remains controversial for deep-seated lesions away from the surface of the brainstem, or for lesions that are inaccessible to “safe entry zones”. Other treatments, such as radiosurgery and medication, are still debatable, which might act as alternative modes of management for lesions amenable to, but at a high risk during surgery.

**Contributed by Dr. Mazda K Turel**


Spontaneous intracerebral hemorrhage (sICH) is a devastating disease with a high mortality and morbidity, and application of decompressive craniectomy (DC) in sICH is controversial. The authors conducted a systematic review to verify the effect of DC on improving outcome in sICH. Through an extensive searching of several electronic databases, they screened eligible publications. The overall effect showed that DC significantly reduced the poor outcome compared with the control group \((P = 0.03)\). But in the subgroup analyses, only studies published after 2010, studies using hematoma evacuation as control, and studies measuring outcome by the Glasgow Outcome Scale showed better outcomes in the DC group than in the control group. Compared with the control group, DC effectively decreased mortality \((P = 0.0008)\). They concluded that DC might improve functional outcomes in certain populations. Thus, the procedure needs further verification. DC is not associated with increased incidences of postoperative rebleeding and hydrocephalus.

**Contributed by Dr. Mazda K Turel**

The authors enrolled patients with occlusion of the intracranial internal carotid artery or proximal middle cerebral artery who had last been known to be well 6 to 24 hours earlier, and who had a mismatch between the severity of the clinical deficit and the infarct volume. Patients \((n = 206)\) were randomly assigned to thrombectomy plus standard care (the thrombectomy group; \(n = 107\)) or to standard care alone (the control group; \(n = 99\)). The rate of functional independence at 90 days was 49% in the thrombectomy group as compared with 13% in the control group. The rate of symptomatic intracranial hemorrhage did not differ significantly between the two groups (6% in the thrombectomy group and 3% in the control group, \(P = 0.50\)), nor did the 90-day mortality (19% and 18%, respectively). Hence, the authors concluded that in this subset of patients, outcomes for disability at 90 days were better with thrombectomy plus standard care than with standard care alone.

**Contributed by Dr. Mazda K Turel, Dr. Srijithesh PR and Dr. Kuntal K Das**


The evidence for the risk of seizures following surgery for brain arteriovenous malformations (bAVM) is limited. The authors conducted this study in 559 patients to determine the risk of seizures after discharge from surgery for a supratentorial bAVM.

Preoperative histories of more than 2 seizures and an increasing maximum diameter of bAVM were found to be significantly associated with the development of postoperative seizures. The cumulative risk of first seizure after discharge from the hospital following resection surgery for all patients with bAVM was 6% and 18% at 12 months and 7 years, respectively. The 7-year risk of developing postoperative seizures ranged from 11% for patients with bAVM \(\leq 4\) cm and with 0 to 2 preoperative seizures, to 59% for patients with bAVM \(> 4\) cm and with \(> 2\) preoperative seizures.

**Contributed by Dr. Mazda K Turel**


Ablative neurosurgery has been used to treat Parkinson’s disease for many decades. The authors investigated the safety and preliminary efficacy of unilateral subthalamotomy by focused ultrasound in Parkinson’s disease. Ten patients with markedly asymmetric Parkinsonism that was poorly controlled pharmacologically were enrolled for focussed ultrasound unilateral subthalamotomy. At a 6-month follow-up period, 38 incidents of adverse events had been recorded, none of which were serious or severe. The most frequent adverse events were transient gait ataxia, transient pin-site head pain, and transient high blood pressure. The mean Movement Disorder Society-Unified Parkinson’s disease Rating Scale (MDS-UPDRS III) score in the treated hemibody improved by 53% in the off-medication state, and by 47% in the on-medication state, respectively, after 6 months. Large randomised controlled trials are necessary to corroborate these preliminary findings and to assess the potential of such an approach to treat Parkinson’s disease.

**Contributed by Dr. Manjul Tripathi**


Gamma knife radiosurgery (GKRS) is rapidly emerging as the preferred form of adjuvant radiation therapy for intracranial metastases over the conventional whole brain radiotherapy (WBRT). However, the definition of the lesion on magnetic resonance imaging (MRI) remains a controversial topic due to lack of specific guidelines for defining the target volume. Conventionally, GKRS is preferred for radiologically well-circumscribed lesions. However, determination of the ideal tumor volume in metastases in particular is complicated by the perilesional infiltration zone or peritumoral brain edema. The assessment of the ideal tumor volume becomes more difficult in lesions with subtotal excision, as well as cases who develop a post-resection hematoma. In this consensus statement, guidelines have been proposed for defining the tumor volume for stereotactic radiosurgery (SRS). The recommendations suggest that the clinical target volume (CTV) should include the entire contrast enhancing surgical cavity on a T1 weighted, gadolinium enhanced axial MRI scan, excluding the region of edema determined on MRI. CTV should include the entire surgical tract visualized on postoperative computed tomographic/MRI scans even for the deep seated lesions. If the tumor was in contact with the dura preoperatively, CTV should include a 5- to 10-mm margin along the bone flap beyond the initial region of preoperative tumor contact. If the tumor was not in contact with the dura, CTV should include a margin of 1 to 5 mm along the bone flap. If the tumor was in contact with a venous sinus preoperatively, CTV should include a margin of 1 to 5 mm along the sinus. Though these expert guidelines need further validation in the prospective studies, at present they are the best radiological guidelines available for lesion definition.

**Contributed by Dr. Mazda K Turel**
with stereotactic radiation techniques, such a trial does not seem feasible even in the near future. This consensus statement based on the literature review of 55 articles (majority being retrospective studies) provides evidence based management guidelines for VS for a single/multi-session stereotactic radiosurgery (SRS) with gamma knife radiosurgery and Linac based system, and fractionated stereotactic radiotherapy (FSRT). On an evidence based practice, it can be concluded that GKRS provides 91-99% tumor control rate at 5 years. On the other hand, a single fraction Linac SRS provides upto 90%, and FSRT provides 96-100% tumor control rate at 5 years. Due to its high precision, selectivity, and sharp dose fallout, GKRS provides the best long term outcome for facial, trigeminal, and hearing preservation. Surprisingly, the quality of life studies were in conflict in deciding the superiority of one modality over the other (observation, surgery, or radiation therapy). As a consensus statement, single fraction GKRS remains the best treatment option for a newly diagnosed Koos grade I-III VS, and for a growing Koos grade I-III VS without mass effect.

**Contributed by Dr Manjul Tripathi**


The 2016 update of the World Health Organisation (WHO) classification for central nervous system tumors has included not only better and accurate characterization of gliomas but also has provided a substantial framework for devising guidelines for their management. However, certain specific concerns on the lesser known genetic signatures such as MPTP, BRAF, ATRX mutations still remain unevaluated in the long term. Pediatric low grade gliomas (PLGG) represent a distinct clinical entity whose behavior remains different from their adult counterparts. In a major population based analysis, the authors have identified a high incidence of BRAF V600E mutation in PLGG. Presence of BRAF V600E mutation confers a significantly poor outcome after chemo- and radiotherapy with a ten-year progression-free survival in the range of 27% in comparison to 60% in patients possessing the wild form of the gene. This research demands exploration of new chemotherapeutic options and guidelines for management for this distinct patient cohort.

**Contributed by Dr Manjul Tripathi**


Traumatic brain injury (TBI) is the bane of modern civilization. On a philosophical point, this should be considered the worst kind of insult to the central nervous system (CNS) because the victim is otherwise in a perfect homeostatic condition before trauma; and, the only factor that determines his outcome is prevention of primary and secondary injuries after the trauma. Among all injuries, TBI should be given the highest priority as these patients are usually in the younger age group, suffer from no comorbid illnesses, and their chances of recovery are better than most of the CNS malignancies. It is disheartening to know that our governments fail to address this major public health problem. Even the general population frequently neglects the safety warnings and parameters despite knowing the possible consequences. An apt example is non-willingness of female two wheeler riders to wear a helmet despite a high female literacy rate in most cities of India. This consensus statement by the leading groups of the world has put forward their expert opinion about the hidden epidemic of the trauma. As traumatic brain and spine injury occurs in different settings, and the modes of prevention are also highly variable across the world, there cannot be a single recommendation for all the settings. Hence, this dossier details the need for governmental commitment, the requirement for the development of insight in the policy makers, the modes of primordial, primary, secondary, and tertiary prevention, and on the practical aspects of prevention of TBI in the general population so that the burden of unwanted deaths and disability can be lessened.

**Contributed by Dr Manjul Tripathi**


This interesting article has sparked significant medicolegal and ethical debate for the individual rights of a patient. A 70-year old male patient was received in an unconscious state. The medical team identified a “Do Not Resuscitate” tattoo with his signatures on his chest. After multiple rounds of talks with the medical team and the ethics committee of the institute, the decision was taken to honor the patient’s will. Such an unprecedented situation, with no one accompanying the patient, creates more confusion than clarity. In this era, tattoos are more frequently engraved than before. The thinking process of the person and the mind frame might be different at the time of engraving the tattoo and may not necessarily represent his later views on the same topic. It becomes a very perplexing situation for the treating medical team as it leads to a dilemma in patient care. The immediate cost of misunderstanding the message and in not providing the ideal care would be a fatal outcome.

**Contributed by Dr Manjul Tripathi**


Extensive newer trials are underway exploring the possibility of prevention of migraine by using targeted antibodies against the various receptors and molecules incriminated in the pathogenesis of migraine. This trial used fremanezumab, a humanized monoclonal antibody against Calcitonin Gene Related Peptide (CGRP), for prevention of migraine versus a placebo. The investigators recruited 1130 patients irrespective of the duration and severity of chronic migraine and divided them into three groups. One group received fremanezumab quarterly (a single dose of 675 mg at baseline and a placebo at weeks 4 and 8), fremanezumab monthly (675 mg at baseline and 225 mg at weeks 4 and 8), or a matching placebo. The drug and placebo were given as a subcutaneous injection. The proportion of patients with a reduction of at least 50%
in the average number of headache days per month was 38% in the fremanezumab-quarterly group, 41% in the fremanezumab-monthly group, and 18% in the placebo group. Thus, fremanezumab was useful in reducing the severity of headache as compared to the placebo in this study. Further studies would be needed to assess the long-term efficacy and safety of the drug.

**Contributed by Dr. Ravi Yadav and Dr. Sahil Mehta**


The current study tested the efficacy of human monoclonal antibody directed against calcitonin gene related peptide (CGRP) receptor in patients with episodic migraine. The study randomized 955 patients into three groups. The patients were administered subcutaneous injection of either erenumab, at a dose of 70 mg (n = 317) or 140 mg (319), or a placebo (n = 319) monthly for 6 months. The primary end point of the study was the change from baseline from the 4th to the 6th month in the mean number of migraine days per month. The most important result of the study was a 50% or greater reduction in the mean number of migraine days per month in 43.3% of patients in the 70-mg erenumab group and in 50.0% of patients in the 140-mg erenumab group, as compared with 26.6% subjects in the placebo group. There was improvement in other scores as well. This trial shows that the therapy based on both CGRP targets (molecule and receptor) could be useful in patients with migraine.

**Contributed by Dr. Ravi Yadav**


Gene replacement therapy could prove to be a game changer in many of the degenerative neurologic disorders. This study used functional replacement of the mutated gene that encodes for survival motor neuron 1 in the disease, spinal muscular atrophy type 1 (SMA1). Fifteen patients with SMA1 were recruited and were administered a single dose of intravenous adeno-associated virus serotype 9 carrying the SMN complementary deoxyribose nucleic acid (DNA) encoding the missing SMN protein. Three patients received a low dose while 12 patients received a high dose of the replacement therapy. The primary outcome was ‘safety’, and the secondary outcome was ‘time until death’. As compared to the rate of survival of 8%, all the patients were surviving on a particular date in August 2017. There was also significant improvement noticed in the motor functions. The authors concluded that in patients with SMA1, a single intravenous infusion of adeno-associated viral vector containing DNA coding for SMN led to a prolonged survival, a higher gain of motor milestones, and improvement in the motor function, as compared to the reported survival. Although the study awaits the reproduction of similar findings in a much larger group of patients, this study may be a significant step in the management of patients with SMA1.

**Contributed by Dr. Ravi Yadav**


Spinal muscular atrophy (SMA) is an autosomal recessive disorder which results from inadequate levels of survival motor neuron protein. Nusinersen is an antisense oligonucleotide drug that modifies pre-messenger ribose nucleic acid (RNA) splicing of the SMN2 gene and thus promotes increased production of the full-length SMN protein. In this phase 3 trial performed on infants with SMA, the results showed a higher motor response and a higher chances of survival than in the control group. An earlier treatment with this drug was more likely to improve the outcomes.

**Contributed by Dr. Ravi Yadav**


Triple antiplatelet drugs (clopidogrel, aspirin and dipyridamole), being used as intensive therapy in patients with acute ischemic stroke, were compared with the standard therapy of clopidogrel or aspirin and dipyridamole combination in this international prospective randomized double blind open labelled multicenter trial. The patients were recruited within 48 hours of the occurrence of the episode of acute ischemic stroke or transient ischemic attack. 3096 participants (1556 in the intensive antiplatelet therapy group and 1540 in the standard antiplatelet therapy group) were recruited from 4 countries. The trial was prematurely terminated by data monitoring and safety committee because of significantly higher incidence of bleeding complications in patients in the intensive therapy group. There was no difference in the incidence and severity of recurrent strokes between the two groups. The results of this study strongly recommend against an intensive triple antiplatelet therapy over the standard policy at this point

**Contributed by Dr. Ravi Yadav**

**Carlsen LN, et al. Complete detoxification is the most effective treatment of medication-overuse headache: A randomized controlled open-label trial. Cephalalgia 2017 doi: 10.1177/0333102417737779.**

Medication overuse headache (MOH), a common cause of chronic daily headache, is often treated by withdrawal of the offending drugs, a process called detoxification. In this randomized control trial, two detoxification regimens, one involving complete removal of the symptomatic drug (program A) and another involving partial withdrawal of the drug (program B) were evaluated. At 6 months and 12 months of the beginning of the regime, both regimens were found to be effective although the complete detoxification group did better. Despite a lack of statistical significance in the intention-to-treat analysis, reduction in the number of headache days in the
complete detoxification regimen was more than half of the partial program (46% vs 22%). The study demonstrated the effectiveness of the complete detoxification protocol in a homogenous cohort of patients with medication overuse headache. But this does not necessarily reflect the patient profile in the clinics as a significant number of MOH patients have psychiatric co-morbidities, and this may affect the external validity of the conclusions. Nevertheless, complete detoxification is a goal worth pursuing as an ideal regimen for MOH.

Contributed by Dr. Srijithesh PR


Persistent idiopathic facial pain (PIFP), characterized by a dull, nagging pain that lasts more than 2 hours per day for more than 3 months, is often considered together with the atypical or type 2 trigeminal neuralgia. It has been proposed by certain authorities that the term atypical facial pain should be reserved only for patients with evidence of a somatoform pain disorder; and, in facial pain patients without evidence of a somatoform pain disorder, the diagnosis of classical trigeminal neuralgia should be considered. In this study, the clinical characteristic and neuroanatomical finding of patients with a diagnosis of persistent idiopathic facial pain was studied. 53 patients from a Danish Headache center were evaluated for any visible neurovascular contact (NVC) between a blood vessel and the trigeminal nerve, which was graded on a three-point scale. Thirty-two patients (60%) had evidence of NVC. However, there was no difference in the presence or degree of NVC comparing the symptomatic and asymptomatic side. Only 3% had displacement of the nerve by the artery, and none had atrophy of the nerve. 43% patients had a co-morbid headache. There was low prevalence of features that are characteristic of the classical trigeminal neuralgia like stabbing pain, touch evoked pain and remission periods. The study provides additional evidence that PIFP is a distinct entity and should not be considered as a part of type 2 trigeminal neuralgia.

Contributed by Dr. Srijithesh PR


A significant proportion of ischemic stroke patients, otherwise eligible for mechanical thrombectomy, become ineligible owing to their infarct progression during transfer to higher centers. In this study, the predictors of this infarct progression were evaluated in a retrospective fashion utilizing the Alberta stroke program early CT score (ASPECTS) decay over time. The critical threshold of the ASPECT score was 6. The degree of collateral blood flow was rated. Three hundred and sixteen patients were included in the study. After adjusting for covariates, the collateral blood vessel status demonstrated the highest adjusted odds ratio of 5.14 (95 CI, 2.20-12.70; P < 0.001) for ASPECTS decay. Other factors included the clinical severity measured by the National Institutes of Health Stroke Scale (NIHSS) score and a poor baseline ASPECT score. The study underscores the importance of vascular imaging and collateral blood vessel assessment in prognosticating and triaging emergent ischemic stroke associated with a large vessel occlusion that develops in patients during their transfer for endovascular intervention.

Contributed by Dr. Srijithesh PR


Most patients with chronic inflammatory demyelinating polyneuropathy (CIDP) need long-term intravenous immunoglobulin. Despite being there as an alternative option, the administration of subcutaneous immunoglobulin (SCIg) has not previously been investigated in any large trial. The PATH study, a randomized, double-blind, placebo-controlled trial was aimed to ascertain the role of subcutaneous immunoglobulin in the management of chronic inflammatory demyelinating polyneuropathy. 172 adults with a definite or probable CIDP, who responded to intravenous immunoglobulin treatment were included for this study from 69 centers. The participants were randomly allocated to receive 0·2 g/kg or 0·4 g/kg of a 20% SCIg solution weekly versus a placebo (2% human albumin solution) for maintenance treatment for 24 weeks. The primary outcome was the proportion of patients with a CIDP relapse or those who were withdrawn for any other reason during the 24 weeks of treatment. 36 patients on a placebo, 22 on a low-dose SCIg, and 19 on a high-dose SCIg had a relapse or were withdrawn from the study for other reasons. Absolute risk reduction was 30% for a high-dose treatment versus a placebo; and, 6% for a high-dose treatment versus a low-dose treatment. Causally related adverse events occurred in 10 patients in the placebo group and in 20 in the high-dose group. This study, therefore, provides a strong evidence for a good efficacy as well as a good level of tolerance for SCIg in CIDP, suggesting that it has potential for use as a maintenance treatment for CIDP.

Contributed by Dr. Aastha Takkar


Post-stroke pneumonia is among the most common acute complications after stroke. It is usually associated with a poor long-term outcome. Biomarkers that may help in identifying patients at high risk for developing stroke-associated pneumonia (SAP) may help in guiding prompt and adequate treatment. This multicenter, randomized controlled clinical trial with blinded assessment of outcomes investigated whether procalcitonin (PCT) ultrasensitive (PCTus)-guided antibiotic treatment of SAP could improve the functional outcomes after stroke. 227 patients with severe ischemic stroke in the middle cerebral artery territory were randomly assigned within 48h after
Symptom onset to PCTus-based antibiotic therapy in addition to stroke unit care or to standard stroke unit care alone. The primary endpoint was functional outcome at 3 months. Secondary endpoints included the usage of antibiotics, the infection rates, the days of fever, and mortality. PCT-guided therapy did not improve functional outcome as measured by modified Rankin Score. Pneumonia rate and mortality were similar in both the groups. Days with fever tended to be lower in PCT compared to the control group. A post hoc analysis including all PCT values in the intention-to-treat population demonstrated a significant increase on the first day of infection in patients with pneumonia and sepsis, compared to the patients with urinary tract infections or without infections. Thus, this study demonstrates that PCT, despite being a promising biomarker for early detection of pneumonia and sepsis in acute stroke patients, does not improve the eventual functional outcomes.

Contributed by Dr. Aastha Takkar


Diagnostic error remains an important source of medical error. As far as optic neuritis is concerned, an over-diagnosis may prompt unnecessary and costly diagnostic tests, procedures, and treatments. This retrospective clinic based cross sectional study was carried out to assess the incidence of, and characterize factors contributing to the over-diagnosis of acute optic neuritis. The data of 122 patients of acute optic neuritis was analyzed. Definite diagnosis was determined by neuro-ophthalmologists. For patients with alternative diagnoses, the Diagnosis Error Evaluation and Research taxonomy tool was applied to categorize the type of diagnostic error. The primary outcome was the primary type of diagnostic error. 49 out of 122 patients were confirmed to have optic neuritis, and 73 had an alternative diagnosis. The most common alternative diagnoses were headache and eye pain, functional visual loss, and other optic neuropathies, particularly non-arteritic anterior ischemic optic neuropathy. In patients with alternative diagnoses, 12 had normal magnetic resonance imaging findings preceding the referral, 12 had received a lumbar puncture and 8 had received unnecessary treatment with intravenous steroids. The data suggests that nearly 60% of patients referred for optic neuritis had an alternative diagnosis, with the most common errors being overreliance on a single item of history and failure to consider alternative diagnoses. Awareness regarding the overdiagnosis of optic neuritis may help in avoiding unnecessary investigations, interventions and treatment.

Contributed by Dr. Aastha Takkar


Visual impairment in primary central nervous system lymphoma (PCNSL) is mostly caused by intraocular lymphomatous involvement, whereas optic nerve infiltration (ONI) accounts for a very small number of patients. This retrospective analysis of 752 patients with PCNSL was carried out to describe the clinical presentation of ONI, its imaging characteristics, and outcome. 7 patients out of 752 had ONI (5 women and 2 men) with a median age at diagnosis of 65 years. Two patients had initial ONI at diagnosis, and 5 had ONI at relapse. The clinical presentation was marked by rapidly progressive and severe visual impairment in all the patients. The MRI findings showed optic nerve enlargement in 3 patients and contrast enhancement of the optic nerves in all the patients. Additional central nervous system lesions were seen in 4 patients. Examination of the cerebrospinal fluid samples detected lymphomatous meningitis in 2 patients. The clinical outcome was poor and marked by partial recovery in 2 patients, and with persistent and severe low visual acuity or blindness in 5 patients. The median progression-free survival after optic nerve infiltration was 11 months, and the median overall survival was 18 months.

Contributed by Dr. Aastha Takkar


Therapeutic inertia (TI) in medicine is the inertia to initiate or intensify treatments when clearly indicated. Limited information is available on educational interventions to ameliorate knowledge-action gaps in TI. This pilot, double blind, parallel group, randomized clinical trial included 25 neurologists actively involved in managing multiple sclerosis (MS). Participants were exposed to 20 simulated case-scenarios of relapsing–remitting MS with moderate or high risk of disease progression. The educational intervention employed a traffic light system (TLS) to facilitate decisions, allowing participants to easily recognize high-risk scenarios requiring treatment escalation. The primary feasibility outcome was the proportion of participants who completed the study and the proportion of participants who correctly identified a high-risk case-scenario with the “red traffic light.” Secondary outcomes included decision fatigue and the efficacy of the educational intervention measured as a reduction in TI for MS treatment. TI was present in 72% of participants in at least one case scenario. Overall, 77.4% of participants correctly identified the “red traffic light” for clinical-scenarios with a high risk of disease progression. Similarly, 86.4% of participants correctly identified the “yellow traffic light” for cases that would require a reassessment within 6–12 months. Thus, this interesting pilot study shows that educational intervention applying the TLS is feasible and potentially useful.

Contributed by Dr. Aastha Takkar


Pompe disease is a progressive myopathy caused by deficiency of alpha-glucosidase leading to the accumulation of glycogen in various tissues of the body. Late-onset Pompe disease is clinically characterized by progressive limb girdle myopathy with respiratory dysfunction. Enzyme replacement therapy is
available as myozyme (recombinant alpha glucosidase) and is given in a dose of 20 mg/kg intravenously every other week. This prospective study enrolled 102 adult patients and followed them up to 5 years after enzyme replacement therapy. The authors found improvements in muscle strength, pulmonary function and activities of daily living with peak effects at 2-3 years of treatment followed by a plateau or a slight decline.

Contributed by Dr. Sahil Mehta


Preclinical data shows that clemastine fumarate, a first-generation antihistamine, can induce oligodendrocyte differentiation and remyelination without modulating the immune system. In this phase II randomized cross-over trial, the investigators enrolled 50 patients of multiple sclerosis with their disease duration of >15 years with no history of clinical optic neuritis in the past 6 months. The average age of the patients was 40 years; the mean Expanded Disability Status Scale (EDSS) was 2.2; and, a P100 of 128 msec was detectable on full field pattern reversal visual evoked potential. Clemastine was given in a dose of 5.6 mg twice daily. The authors found a shortening of the latency by 1.7 msec after treatment compared to the placebo. This randomized trial showed evidence of drug induced repair in a chronic degenerative condition. As no clinical benefit was observed, further studies are needed for demonstration of the clinical benefit and durability of this treatment.

Contributed by Dr. Sahil Mehta


Management of hemiplegic limbs secondary to an injury to the cerebral hemisphere has remained a major challenge leading to significant motor disability in the patients. In this article, the authors attempted something novel, which was the grafting the contralateral cervical (C) 7 nerve from the non-paralyzed side to the paralyzed side in order to improve motor functions in the hand. They included 36 patients with unilateral arm paralysis of a 5- year duration who were subject to C7 nerve transfer plus rehabilitation (18 patients) or rehabilitation alone (18 patients). The motor power and functioning of the re-innervated limb was assessed at baseline as well as 12 months from the procedure using a specialized scoring system, the Fugl–Meyer upper-extremity scale. The authors noted a 15.1 difference in improvement in the motor score which was strongly significant (P < 0.001). The thumb showed least improvement in spasticity, among the fingers. When the connectivity between the ipsilateral hemisphere and the paralyzed arm was assessed using transcranial magnetic stimulation and functional imaging, a positive correlation was observed. Therefore, the results from this single center study come as a ray of hope for these patients. However, the results have to wait large scale validation at other centers.

Contributed by Dr. Sahil Mehta


Myelin oligodendrocyte glycoprotein (OG) antibody disease is considered milder and less relapsing than aquaporin (AQP)-4 related neuromyelitis optica spectrum disorder (NOMSD). The authors studied the demographic and clinical details of 250 patients with MOG antibody positivity. They found that MOG antibody disease can present at any age and is slightly more common in female subjects with no ethnic bias. Optic neuritis is the most common presentation (it may have bilateral presentation in half of the patient). Transverse myelitis and acute disseminated encephalomyelitis (ADEM) are the other forms of presentation. The prognosis is typically favorable. It is often a relapsing disease and immunosuppression delays the onset of a second relapse. However, 47% can be left with permanent disability affecting the bladder and erectile functions much more than vision and mobility.

Contributed by Dr. Sahil Mehta


Approximately 5% of the patients with systemic sarcoidosis develop central nervous system complications or neurosarcoidosis. There is a lack of evidence regarding the prognostic factors as well as the results of the immunosuppressive treatment in neurosarcoidosis. The authors retrospectively studied 234 patients with a mean follow-up of 8 years. The 10-year survival rate was good. Mortality was associated with age, peripheral nervous system (PNS) involvement and higher baseline Expanded Disability Status Scale (EDSS) score. The 10-year relapse rate was high and encephalitis-like presentation was associated with a higher risk of relapse. Intravenous cyclophosphamide, methotrexate and infliximab were associated with decreased neurologic and non-neurologic relapses. Worsening of EDSS score was associated with encephalitic and PNS involvement. Future prospective studies are needed to confirm these findings.

Contributed by Dr. Sahil Mehta


This study aimed to correlate pre-existent cerebral micro-bleeds (CMBs) with the risk of spontaneous intracerebral hemorrhage (ICH) occurring in future in patients with ischemic stroke who were additionally on oral anticoagulants for atrial fibrillation (AF). AF has been incriminated in the reduction of blood-brain barrier permeability leading to this potential complication. This meta-analysis of pooled data of more than
1,500 patients was evaluated along with a 6-month follow-up. Presence of ≥5 CMBs at baseline was associated with a significant higher future ICH risk in the pooled dataset. This information would help physicians in risk stratification of such patients and in taking future decisions regarding the protocol of anticoagulation therapy.

Contributed by Dr Chirag K Ahuja


Neurosurgical interventions are associated with significant morbidity. The authors devised a pilot study (n = 30) and an analogously performed Phase III trial (n = 112) for evaluating the effect of prophylactic nimodipine and hydroxyethyl starch (HES) in vestibular schwannoma (VS) surgery. The enrolled patients were assigned to 2 groups. The treatment group (n = 70) received parenteral nimodipine (1–2 mg/hour) and HES (hematocrit 30%–35%) from the day before surgery until the 7th postoperative day, while the control group (n = 72) was not treated prophylactically. Facial and cochlear nerve functions were documented preoperatively, during the inpatient care, and 1 year after surgery. The treatment group showed a significantly lower risk for hearing loss at 12 months compared with the control group. This benefit persisted even after adjustment for tumor size. However, the facial nerve function did not significantly improve with treatment. Dose-dependent hypotension was noted in the treatment group; however, this phenomenon had no clinical consequences. Therefore, as shown in this study, prophylactic neuroprotective strategy may prove to be a promising concept in invasive neurosurgery.

Contributed by Dr. Chirag K Ahuja


The authors aimed to investigate whether or not pre-existing small vessel disease (SVD) had a bearing on the amount of blood–brain barrier (BBB) leakage in ischemic and non-ischemic areas before the institution of intravenous (IV) thrombolysis in acute ischemic stroke. This study was a retrospective analysis of data from the Stroke Imaging Repository and the Virtual International Stroke Trials Archive resources. Only the patients treated with IV thrombolysis and having pre-treatment MRI were included for analysis. BBB leakage was estimated by evaluating perfusion-weighted processed data. It was identified that increased SVD grade (lacunar infarcts and brain atrophy) was significantly associated with BBB leakage in both ischemic and non-ischemic areas of the brain. Thus, patients of acute ischemic stroke, having features predictive of SVD, should be carefully chosen for thrombolysis in view of an increased perceived risk of haemorrhage.

Contributed by Dr. Chirag K Ahuja


It had been a perceived notion that flow diverters have revolutionized the treatment of difficult giant, fusiform and wide-necked aneurysms. The Flow Diversion in the Treatment of Intracranial Aneurysm Trial (FIAT) was designed to guide the clinical use of flow diversion within a care trial and to study its safety and efficacy. The trial proposed randomized allocation of aneurysms to flow diversion or standard management options (observation, coil embolization, parent vessel occlusion, or clip placement) and also evaluated a flow-diverter registry. The primary safety outcome was death or dependency (modified Rankin Scale score >2) at 3 months, to be determined for all patients who received flow diversion at any time. The primary efficacy outcome was angiographic occlusion at 3–12 months combined with an independent favorable clinical outcome. Of the 112 participating patients, 78 were randomized (39 in each arm), and 34 received flow diversion within the registry. Death or dependency occurred in 5 (13.2%) of the 38 patients randomly allocated and treated by flow diversion and in 5 (12.8%) of the 39 patients allocated to the standard treatment group. Efficacy was below expectations of the trial hypothesis: 16/38 patients randomly allocated to flow diversion failed to reach the primary outcome, as compared with 14/39 patients allocated to standard treatment. Thus, flow diversion was not as safe and effective as hypothesized. Before being considered as a panacea for aneurysm treatment, flow diverters need to prove their efficacy and safety in future randomized trials.

Contributed by Dr. Chirag K Ahuja


Intravenous alteplase has a definite risk of causing intracerebral hemorrhage, and therefore, a lower dose seems to be a safer treatment option than the standard dose. Would a lower dose be of similar benefit in terms of treatment outcome remains a question to be answered. This was prespecified secondary analysis of the Enhanced Control of Hypertension and Thrombolysis Stroke Study (ENCHANTED), an international, randomized, open-label, blinded, end-point clinical trial of low-dose vs standard-dose intravenous alteplase for patients with acute ischemic stroke (AIS). It included 3310 older, Asian, or severely affected patients with AIS, who were considered as being high-risk patients for thrombolysis. Patients were randomly assigned to receive low-dose (0.6 mg/kg; 15% as bolus and 85% as infusion over 1 hour) or standard-dose (0.9 mg/kg; 10% as bolus and 90% as infusion over 1 hour) alteplase. Not only was the functional outcomes between the two groups consistent with that seen with non-Asians, but also there was a lack of significant difference in the treatment effects with respect to poor outcomes (death or disability) when stratified by age, ethnicity, or severity. Although there was consistent reduction in the rates of symptomatic intracerebral hemorrhage...
with low-dose alteplase, this was not statistically significant by age, ethnicity, or severity. The effects of low-dose alteplase were, thus, not clearly superior to the effects of standard-dose alteplase on death or disability.

Contributed by Dr. Chirag K Ahuja


Perivascular spaces (PVSs) have always intrigued us regarding their clinical importance. An increased visibility of PVSs on magnetic resonance imaging (MRI) with an advancing age is hypothesized to represent impaired drainage of interstitial fluid from the brain, reflecting an underlying cerebral small vessel disease (SVD). However, whether or not large perivascular spaces (L-PVSs) (>3 mm in diameter) visible on MRI are associated with SVD and cognitive deterioration in older individuals is unknown. This prospective, population-based age, gene/environment susceptibility study aimed at inferring the association of L-PVSs with clinical cognitive decline. 2612 participants were enrolled in the study and underwent MRI and neuropsychological testing. The presence, number, and location of L-PVSs were evaluated. Of the 2612 study patients, 424 had L-PVSs (prevalence - 16.2%). After adjusting for age, sex, and interval between the baseline and follow-up scanning, the presence of L-PVSs was significantly associated with an increased risk of incidents of subcortical infarcts and microbleeds and a greater 5-year progression of the white matter hyperintensity volume. The presence of L-PVSs was also associated with an increased risk of vascular dementia (four times). It was thus established that large PVSs are an MRI marker of SVD and are associated with the pathogenesis of vascular-related cognitive impairment in older individuals.

Contributed by Dr. Chirag K Ahuja


Digital subtraction angiography (DSA) is the gold standard in the diagnosis and characterization of intracranial aneurysms but is potentially associated with significant morbidity. Computed tomography (CT) technology with high detector rows has started to emerge as a reasonable non-invasive alternative technique to the DSA for detecting intracranial aneurysms. The present study aimed to assess the diagnostic accuracy of the 320-detector row non-subtracted and subtracted volume CT angiography (VCTA) as a non-invasive modality in detecting small cerebral aneurysms (<3 mm) in comparison with the three dimensional (3D) DSA. 662 patients underwent 320-detector row VCTA and 3D DSA for suspected cerebral aneurysms. 3D DSA was considered the reference standard, and the sensitivity, specificity, and accuracy of the non-subtracted and subtracted VCTA in depicting small aneurysms were analyzed. The sensitivity, specificity, and accuracy of the non-subtracted VCTA in depicting small aneurysms were 89.8%, 99.2%, and 96.5%, respectively. The sensitivity, specificity, and accuracy of subtracted VCTA in depicting small aneurysms were 96.9%, 99.2%, and 98.6%, respectively. There was no significant difference in the accuracy between the subtracted VCTA and 3D DSA. However, non-subtracted VCTA had significantly lower sensitivity than 3D DSA and subtracted VCTA. To conclude, subtracted 320-detector row VCTA has shown a great potential to replace 3D DSA in the diagnosis of small cerebral aneurysms (<3 mm), the diagnosis of which represents a serious limitation of CTA.

Contributed by Dr. Chirag K Ahuja


This study re-evaluated the impact of surgery in low grade gliomas in the wake of recent revision of glioma classification by the World Health Organisation. The study included 228 operated patients with low grade gliomas whose tissue blocks were subjected to the recommended battery of molecular markers to update the histological diagnosis as per the recent classification. Thereafter, the postoperative residual tumor volume was correlated with outcomes. The authors noted that 39 patients (17.1%) required their histopathological diagnosis to be revised after the molecular analysis. 15.4% patients were documented to have complete tumor excision while only minimal tumor residue was seen in 23.7% patients. They noted that every cubic mm increase in the size of the residual tumor translated into an increased odd of impaired overall survival (odds ratio = 1.01, P = 0.016). It was also noted that isocitrate dehydrogenase (IDH) mutated astrocytoma patients, in particular, showed a negative effect on the overall survival, with even the slightest of postoperative residual tumor volume remaining. The authors thus re-emphasized the utility of gross total tumor excision in low grade gliomas even in this era of revised glioma classification. Interestingly, the study also argues for a second-look operation for subtotaly resected IDH mutated astrocytomas.

Contributed by Dr. Kuntal K Das


Vasospasm and delayed cerebral ischaemia (DCI) remains a major bane in the management of aneurysmal subarachnoid hemorrhage, often negatively affecting the outcome. Management of DCI has remained a key area of research over the years, and induced hypertension has been frequently used to combat DCI all over the world. However, evidence supporting the use of induced hypertension is rather weak. Therefore, this study assumes a great importance. Although the study aimed to include 240 patients, it eventually had to be halted after recruiting only 41 patients. However, the results were strikingly evident even with such a small number of recruited patients.

Contributed by Dr. Chirag K Ahuja
The induced hypertension group \((n = 21)\) did not show any significant effect \((\text{OR} = 1, 95\% \text{CI} = 0.6-1.8)\) on the poor outcome at 3 months (modified Rankin Scale score >3). On the contrary, the odds of serious events were rather high \((2.1)\) although it did not attain statistical significance \((95\% \text{CI} = 0.9-5.0)\). Thus, despite being underpowered, this well-designed randomized trial does put a big question mark on the role of induced hypertension as a treatment modality in DCI. However, we shall have to wait for properly designed and adequately powered future trials for a much more convincing answer to this question.

\textit{Contributed by Dr. Anant Mehrotra}


The authors conducted a study on 21 patients with hydrocephalus who had been treated with shunt placement before 2 years of age and these were compared with age- and sex-matched healthy controls. The authors conducted diffusion tensor imaging (DTI) on a 3 Tesla magnetic resonance imaging (MRI) scanner. Outcome was scored based on the Headache Disability Inventory and the Hydrocephalus Outcome Questionnaire. Fractional anisotropy (FA) and other DTI-based measures (axial diffusivity (AD), radial diffusivity (RD), and mean diffusivity (MD), respectively) were extracted in the corpus callosum and internal capsule with manual region-of-interest delineation, and in other regions with tract-based spatial statistics (TBSS). The authors found a significantly lower FA for patients than for controls in 20 of the 48 regions, mostly posterior white matter structures, and in the periventricular as well as more distal tracts. Of these 20 regions, 17 demonstrated increased RD, while only 5 showed increased MD and 3 showed decreased AD. No areas of increased FA were observed. The authors concluded that TBSS-based DTI is a sensitive technique for elucidating changes in white matter structures due to hydrocephalus and chronic cerebrospinal fluid shunting.

\textit{Contributed by Dr. Anant Mehrotra}


The authors conducted a systematic review and meta-analysis of 22 studies (12 randomized controlled trials and 10 cohort studies) comprising 1,31,714 patients to assess the outcome among patients treated with concomitant proton pump inhibitor (PPI) and thienopyridines versus thienopyridine alone. The authors found that concomitant use of PPI with thienopyridines was associated with increased risk of ischemic stroke (risk ratio, 1.74; 95% confidence interval [CI], 1.41–2.16; \(P < 0.001\)), composite stroke/myocardial infarction (MI)/cardiovascular death (risk ratio, 1.14; 95% confidence interval (CI), 1.01–1.29; \(P = 0.04\)), and MI (risk ratio, 1.19; 95% CI, 1.00–1.40; \(P = 0.05\)). Similarly, in adjusted analyses, the concomitant use of PPI with thienopyridines was again associated with increased risk of stroke (hazard ratios adjusted, 1.30; 95% CI, 1.04–1.61; \(P = 0.02\)), composite stroke/MI/cardiovascular death (hazard ratios adjusted, 1.23; 95% CI, 1.03–1.47; \(P = 0.02\)), but not with MI (hazard ratios adjusted, 1.19; 95% CI, 0.93–1.52; \(P = 0.16\)). The authors concluded that co-prescription of PPI and thienopyridines with proton pump inhibitors and thienopyridines.

\textit{Contributed by Dr. Anant Mehrotra}
increases the risk of incident ischemic strokes and composite stroke/MI/cardiovascular death.

Contributed by Dr. Anant Mehrotra


The authors conducted a retrospective analysis of prospective data (from a nationwide registry) on 1866 patients with aneurysmal subarachnoid haemorrhage. In-hospital mortality was 20% (n = 373). In 197 patients (10.6%), active treatment was discontinued after hospital admission (no aneurysm occlusion attempted), and this cohort was excluded from analysis of the main statistical model. In the remaining (n = 1669) patients, the rate of in-hospital mortality was 13.9% (n = 232). Strong independent predictors of in-hospital mortality were rebleeding (adjusted odds ratio [aOR], 7.69; 95% confidence interval, 3.00–19.71; \( P < 0.001 \)), cerebral infarction attributable to delayed cerebral ischemia (aOR, 3.66; 95% confidence interval, 1.94–6.89; \( P < 0.001 \)), intraventricular hemorrhage (aOR, 2.65; 95% confidence interval, 1.38–5.09; \( P = 0.003 \)), and new infarction post-treatment (aOR, 2.57; 95% confidence interval, 1.43–4.62; \( P = 0.002 \)). The authors concluded that there are various factors that seem to be associated with in-hospital mortality after aneurysmal subarachnoid hemorrhage.


The authors used three-dimensional angiographic data of 665 patients (160 patients with anterior communicating artery aneurysms [Acom], 66 with non-Acom aneurysms, and 439 control subjects with no aneurysms) to examine the angiographic features of anterior communicating artery aneurysms. Female subjects between the age of 50-70 years were more prone to develop Acom artery aneurysm as compared to males. The Acom/A2 bifurcation angle was significantly increased (\( P < 0.0001 \)) with an increase in the patient’s age. The size of the Acom aneurysm dome and neck was positively correlated with the diameter of the Acom, A1 and A2 segments (\( P < 0.0001 \)). The Acom/A2 bifurcation angle was significantly (\( P < 0.0001 \)) wider in patients with rather than without Acom aneurysms, whereas the A1/A2 angle was significantly smaller in patients with, rather than without Acom aneurysms (\( P < 0.0001 \)). The Acom aneurysms at the bifurcation apex mostly deviated toward the smaller angle formed between the parent A1 and branches and toward the daughter artery with a smaller diameter. The Acom aneurysms were located mostly on the dominant anterior cerebral artery.