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AOCN-0381
Nerve and Muscle Ultrasound workshop

QUANTITATIVE MUSCLE ULTRASOUND IN NEUROGENIC AND MYOPATHIC DISORDERS

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Muscle ultrasound has developed a role as a useful diagnostic modality to supplement clinical and electrodiagnostic findings in neuromuscular disease. Normal muscle has a characteristic 'starry night' pattern. In nerve and muscle disease the thickness of muscle decreases and echogenicity (brightness) of muscle increases. Myopathy typically demonstrates homogenously increased echogenicity (ground glass appearance) while muscle denervation is associated with streaky and patchy increased echogenicity. Muscle size can be quantified by measuring thickness, or cross sectional area for smaller muscles. There are a number of methods of quantifying echogenicity including semiquantitative visual methods, grayscale analysis and more sophisticated approaches. Advanced ultrasound techniques such as elastography may provide further quantitative information in neuromuscular disease.

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AOCN-0352
Nerve and Muscle Ultrasound workshop

NERVE AND MUSCLE ULTRASOUND - EMERGING ROLE IN MND/ALS

Y. Noto[1]
[1]*, Kyoto, Japan*

In the diagnosis and assessment of amyotrophic lateral sclerosis (ALS), the roles of nerve and muscle ultrasound are manifold. Nerve ultrasound has revealed that cross-sectional area (CSA) was decreased in the median nerve (at the wrist/upper arm level), the ulnar nerve (at the wrist/forearm level) and the nerve roots in ALS. A longitudinal study of changes in nerve CSA demonstrated the possibility that ulnar nerve CSA could be a useful biomarker to monitor disease progression in ALS. Muscle ultrasound is useful for detecting fasciculations which are essential findings in the diagnosis of ALS. Although fasciculations are commonly identified in the foot and calf muscles in normal individuals, widespread and frequent fasciculation occur in the condition of ALS. Muscle ultrasound is suitable for assessing the distribution and frequency of fasciculations non-invasively. In terms of the muscle thickness and echo intensity, decreased muscle thickness, increased echo intensity are typical findings of ALS and can be found in muscles with preserved strength. However, the pattern of longitudinal muscle changes in ALS is highly variable and shows no evident correlation with functional measures. In addition, muscle ultrasound can measure the thickness of the diaphragm and the tongue muscle. Decreased thickness of the diaphragm indicates pulmonary dysfunction, and decreased thickness of the tongue suggests swallowing dysfunction.

Although modern MRI technique also has progressed and is increasingly being used as a nerve and muscle imaging tool, nerve and muscle ultrasound will find a wider distribution in the neuromuscular laboratory due to its convenience and enable neurologist/neurophysiologists to diagnose and to assess ALS more accurately coupled with an electromyography machine.

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AOCN-0329
Nerve and Muscle Ultrasound workshop

NERVE ULTRASOUND IN INFLAMMATORY AND INHERITED NEUROPATHIES

N. Shahrizaila[1]
[1], *Malaysia*

In recent years, peripheral nerve ultrasound has emerged as a promising tool in the diagnosis of peripheral nerve disorders. Nerve ultrasound adds value by providing information on nerve morphology thus complementing functional information obtained from nerve conduction studies. Studies have demonstrated distinctive features on nerve ultrasound in patients with inherited neuropathies such as Charcot-Marie-Tooth disease and inflammatory neuropathies including Guillain-Barre syndrome and chronic inflammatory demyelinating polyneuropathy. In this talk, the characteristic ultrasound findings in both these conditions to date will be discussed.

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AOCN-0385
TC2: Movement Disorders Teaching Course

DIFFERENTIAL DIAGNOSIS OF PARKINSONIAN DISORDERS

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DIFFERENTIAL DIAGNOSIS OF PARKINSONIAN DISORDERS

Parkinsonian disorders (Parkinsonism) are a heterogeneous entity of movement disorders, which can be subdivided into idiopathic Parkinson's disease (PD), rare genetic forms of PD as well as symptomatic and atypical Parkinsonism. The clinical features are characterized by tremor, bradykinesias, rigidity, and postural reflex impairment.

Though Parkinsonism are not very difficult to recognize, it is important to distinguish among the most common identifiable syndromes. In this talk, I will discuss the key clinical features of these various disorders, including PD, progressive supranuclear palsy, multiple system atrophy, corticobasal ganglionic degeneration, diffuse Lewy body disease, fronto-temporal dementia with Parkinsonism and vascular Parkinsonism. Symptomatology and diagnostic tests, including neuroimaging, genetic test and other laboratory tests for each syndrome will be discussed to offer clinicians guidance in making a differential diagnosis of Parkinsonism.

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AOCN-0384
TC2: Movement Disorders Teaching Course

MANAGEMENT OF PARKINSON'S DISEASE: STATE OF THE ART

B. Jeon[1]
[1], *Republic of Korea*

In this presentation three main topics on PD therapy will be discussed
1. Individualized therapy
2. early therapy: L-dopa vs L-dopa sparing strateegy
3. emerging therapy

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AOCN-0372
TC2: Movement Disorders Teaching Course

PARKINSON'S DISEASE -OVERVIEW OF MOTOR AND NON-MOTOR ASPECTS

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Parkinson’s disease (PD) is a chronic, progressive neurodegenerative disorder characterized by core motor symptoms such as tremor at rest, bradykinesia, rigidity and postural instability. As per the UK PD society brain bank criteria, for the diagnosis of clinically probable PD, there must be bradykinesia along with any of the aforementioned three motor symptoms. Based on this patients with PD are often categorized into (i) tremor dominant (TD) type and (ii) postural instability with gait difficulty (PIGD) type. Freezing of gait and festination are disabling motor symptoms which are often seen in patients with advanced PD.

During the course of the illness, motor complications appear in approximately 50% of patients on levodopa therapy for more than 5 years. These occur as a result of progression of the disease process (increased neuronal degeneration) and the cumulative effect of prolonged treatment with dopaminergic drugs, especially levodopa. The motor complications include (a) motor fluctuations and (b) dyskinesias. Motor fluctuations can be (i) wearing off effects (end-of-dose deterioration), (ii) "ON" and "OFF" phenomena which can be predictable or unpredictable, (iii) nighttime deterioration, and (iv) early morning deterioration. Dyskinesias can be of choreic or dystonic type. These may occur at peak-dose (more often chorea), during "OFF" periods (often dystonia) or a combination of peak-dose and "OFF" period (biphasic), patients often cycling in these two phases. Young onset PD patients are more likely to develop dyskinesias with small dose off dopaminergic drugs early in the course of disease.

PD is no more considered as an isolated disorder of motor system. Several non-motor symptoms (NMS) are present in PD, and may often occur many years earlier than occurrence of motor symptoms. Hyposmia, constipation, autonomic dysfunction, sleep disturbances, psychosis, depression, cognitive impairment, fatigue, pain and akathisia are few of the NMS of PD. REM Behavior Disorder of Sleep (RBD) may precede the onset of motor symptoms in PD by several decades. Impulse control disorders are recently recognized in many patients with PD. PIGD phenotype, longer duration and advanced stage of PD have been described as risk factors for emergence of psychosis and many other NMS. Similar to motor fluctuations, many patients with PD (in up to 60%) can also have neuropsychiatric, autonomic and sensory non-motor fluctuations, which often coincide with motor fluctuations. The NMS may or may not improve with anti-parkinsonian medications which possibly underscore the fact that NMS may develop secondary to mechanisms other than dopamine depletion.

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AOCN-0393
TC3: Epilepsy- Presurgical Evaluation Workshop: Localization of epileptic zone and networks-AOCN-ASEPA

Y. Chinvarun[1]
[1], *Bangkok, Thailand*

The role of neuroimaging, in the selection of patients for epilepsy surgery. Although video-EEG is essential to confirm the diagnosis, and to determine the ictal onset, neuroimaging, in particular magnetic resonance imaging (MRI), forms the basis for selection of most surgical candidates. MRI with epilepsy protocol is able to detect hippocampal sclerosis, the most common cause of temporal lobe epilepsy. Other lesions readily detected on MRI include dysplasia, neuronal migration disorders and cavernomas. Studies have shown that the best postoperative results are achieved in patients with a lesion visible on MRI.

Functional imaging, both single photon emission computed tomography (SPECT), in particular ictal SPECT, and photon emission tomography (PET), are important ancillary investigations providing valuable clinical tools in the management of patients with medically resistant, partial epilepsy who are under evaluation for surgical treatment. The value of PET for localization of seizure activity has been firmly established for patients with temporal lobe epilepsy and extratemporal lobe epilepsy. It is a very useful test partly because it is non-invasive. The localizing value of ictal SPECT is based on cerebral metabolic and perfusion coupling. Ictal hyperperfusion is used to localize the epileptogenic zone noninvasively, and is particularly useful in MRI-negative partial epilepsy and focal cortical dysplasia. However, ictal SPECT should be interpreted in the context of full presurgical evaluation.

Others imaging techniques such as simultaneous EEG and fMRI and MEG can visualize the location of inter-ictal epileptic discharges. Functional MRI to lateralize language and localize primary motor and somatosensory cortex has entered clinical practice and contributed to the decline of the WADA test. If resections are to be made close to eloquent cortex it is recommended to undertake precise mapping of eloquent function, the site of seizure onset and the irritative zone, to minimize the risk of causing new deficit, and optimize the chance of success. These data can assist in deciding on the placement of intracranial electrodes to define the site of seizure onset. These imaging techniques are also found helpful in capturing subtle lesions as possible neocortical or extratemporal foci. Tractography is used to visualize the major cerebral white matter tracts, and to predict and reduce the risks of surgery. Display of the optic radiation and pyramidal tract are the most relevant for epilepsy surgery.

With multi-model imaging modalities, the most important step will be reliable integration of all structural and functional data. Presurgical neuroimaging techniques such as MRI morphometry, DTI, fMRI, EEG/ESI, ictal SPECT/SISCOM and MEG/MSI have made it possible to capture previously undetected dysplastic lesions and other epileptic abnormalities, improve the localization of the epileptogenic zone and the eloquent cortex, and reduce the need for intracranial EEG. However, they still cannot replace intracranial EEG in surgical planning. Thus, a multimodality approach including neuroimaging and invasive intracranial EEG is needed (e.g., to identify subtle abnormalities) in presurgical evaluation especially in non-lesional and extratemporal lobe epilepsies.

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AOCN-0358
TC3: Epilepsy- Presurgical Evaluation Workshop: Localization of epileptic zone and networks-AOCN-ASEPA

SEMIOLOGY
Y. Inoue[1]
[1], *Japan*

Seizure semiology is not static but dynamic in space and time. It arises from ictal activity of epileptogenic zone/network, possible seizure spread, involvement of remote function, or

dynamic interaction between these. The accumulated knowledge of semiology allows us to imagine the dynamic process of a seizure of a given patient when the subjective and objective information as well as information obtained by clinical examination (intervention) are provided. This imagination helps us to determine the seizure origin, an area to be resected, in the presurgical work-up.Some signs indicating lateralization or even localization of epileptogenic zone/network, spreading/synchronization and termination of the seizure (preictal, early ictal, middle/late ictal, postictal signs) will be illustrated in seizures of temporal lobe epilepsy and extra-temporal lobe epilepsy.

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AOCN-0389
TC3: Epilepsy-EEG workshop -AOCN-ASEPA

EEG PATTERNS IN STATUS EPILEPTICUS

G. Kalss[1]
[1], *Austria*

Status epilepticus (SE) is one of the most common neurological emergencies. It has an incidence of approximately 10-60 per 100,000 per year. Mortality rate is still high. In 50% of all cases, SE is acute symptomatic and there is no preexisting epilepsy.

In 2015 the ILAE Task Force on Classification of SE published a new definition and classification on SE [Trinka et al. Epilepsia 2015]. They pointed out four axis of classification: Semiology, etiology, EEG and age.

Semiology is divided in subgroup A with prominent motor symptoms and B without prominent motor symptoms. In the acute phase of the most emergent SE in subgroup A, the convulsive SE, EEG patterns play a minor role, as the diagnosis is a clinical one.

Group B subsumes non convulsive status epilepticus (NCSE) without prominent motor symptoms. In the subgroup, the higher the structural brain damage is, the poorer is clinical outcome [Bauer et Trinka, Epilepsia 2010]. Among these seizures are those without coma, that subsumise absences status or aphasic status and those with coma, what usually indicates brain injury. Especially in patients with coma, EEG is essential to rule out NCSE.

At the 2013 colloquium on Status Epilepticus Beniczky et al proposed EEG criteria for patients without epileptic encephalopathies to define NCSE [Beniczky et al, Epilepsia 2013]. The criteria were revised in 2015 [Leitinger et al Epilepsia 2015]. These new Salzburg Consensus Criteria define NCSE, if the EEG shows rhythmic epileptiform discharges (EDs) with a frequency >2.5 Hz for more than 10 seconds or EEG patterns with epileptiform discharges <2.5Hz or rhythmic delta activity and one of the following additional criteria: typical spatio-temporal evolution, subtle clinical phenomena or electro graphical and clinical improvement after antiepileptic drug application. In case of fluctuation without evolution and EEG improvement without clinical improvement, “possible NCSE” was diagnosed.

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AOCN-0348
TC3: Epilepsy-EEG workshop -AOCN-ASEPA

NON-EPILEPTIFORM DISCHARGES

A.A. Raymond[1]
[1], *Malaysia*

Non-epileptiform Discharges

Although the EEG is used primarily in the diagnosis, classification and presurgical evaluation of epilepsy patients, EEG abnormalities may be seen in various other neurological disorders. Non-epileptiform abnormalities or discharges (NEDs), although non-specific, often provide important clues to the underlying cause of the brain dysfunction and eventual diagnosis, including in patients with epilepsy. In comatose patients, the EEG helps in prognostication and management. In epilepsy patients, focal NEDs are often localized to the same area as the epileptic focus. Depending on the subject's age and state (awake or asleep), NEDs may take the form of focal slow activity, regional or generalized bisynchronous slow activity, generalized asynchronous slow activity, focal attenuation, generalized attenuation/suppression and other abnormal activities (e.g. alpha, theta and spindle coma patterns). The most common NED that is indicative of a focal structural lesion is a focal intermittent or continuous polymorphic slow activity, which is non-reactive to eye opening. FIRDA, OIRDA and TIRDA are associated with conditions affecting cortical and subcortical structures, deep midline lesions, cerebrovascular disease, epilepsy, early stages of coma and several toxic-metabolic encephalopathies. OIRDA is more common in children and may be seen in 15-30% of children with absence epilepsy. TIRDA, related to TLE, is more specific than FIRDA and OIRDA. Bilateral asynchronous slow activity, while highly non-specific, is indicative of an encephalopathy. Focal attenuation may occur in postictal states, focal cortical lesions, subdural collections or dura-based tumours. Generalised attenuation of EEG activity may be seen in normal individuals, but may also represent generalised cortical injury. Burst-suppression is often seen in severe cerebral damage after brain anoxia, drug-induced coma and following status epilepticus. Alpha and theta coma are most commonly found in hypoxic-ischaemic encephalopathy.

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AOCN-0341
TC3: Epilepsy-EEG workshop -AOCN-ASEPA

NORMAL VARIANTS AND COMMON EEG ARTIFACT

J. Dunne[1]
[1], *Australia*

Whilst not as important as a good history, EEG is the most valuable diagnostic test for epilepsy. After first seizure EEG can assist in classification of seizure type (focal vs. generalised) and in assessing risk of recurrence. In established epilepsy, EEG can sometimes help clarify the epilepsy syndrome and guide the choice of treatment.

However, interictal EEG cannot of itself make or exclude a diagnosis of epilepsy. An abnormal EEG with nonspecific findings does not mean the patient has epilepsy, and conversely the sensitivity of a single routine EEG (25-56%) is too low to reliably exclude the diagnosis. The usefulness of EEG depends on good quality recording and reporting. Adequate training is essential. Misinterpretation of many normal variants and artefacts commonly leads to misdiagnosis. Epileptiform activity has a number of defining features, of which morphology is the weakest and most unreliable. It is best to assume the EEG is normal and miss rather than misdiagnose epileptiform abnormalities: all sharp transients are normal variants or artefacts until proven otherwise. Once the diagnosis of epilepsy is established, there are few occasions when it needs to be repeated.

In people with unexplained impairment of consciousness or behaviour, EEG may detect clinically unrecognised seizures or encephalopathy. In unconscious patients non-epileptic movements are very common, and their recognition by EEG prevents inappropriate overuse of antiepileptic drugs.

EEG remains the first and only real-time monitor of epileptic seizures. Long term video-EEG monitoring has an important role in the minority of patients with diagnostic or management difficulties, and in evaluation for epilepsy surgery.

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AOCN-0325
TC3: Epilepsy-EEG workshop -AOCN-ASEPA

THE NORMAL EEG

H.J. Tan[1]
[1]*Universiti Kebangsaan Malaysia Medical Centre, Medicine, Kuala Lumpur, Malaysia*

The electroencephalograph (EEG) is a useful tool in the management of epilepsy patients. The routine 10-20 recording is a standard procedure for analysis of the brain activity. The routine 10-20 montage includes 21 electrodes: Fp2, F4, C4, P4, O2, F8, T4, T6, Fpz, Fz, Cz, Pz, Oz, Fp1, F3, C3, P3, O1, F7, T3, T5. Fp stands for frontopolar, F for frontal, C for central, P for parietal, O for occipital and T for temporal. The EEG recording includes the

background activity, hyperventilation and intermittent photic stimulation, physiological sleep patterns and presence of variants or abnormalities. The background activity can be observed in the posterior quadrants when eyes are closed. The alpha rhythm frequency ranges from 8-13 c/s, beta frequency over 13 c/s, theta frequency ranges from 4-7 c/s and delta frequency under 4 c/s. Reactivity of alpha rhythm upon eye opening and closing is seen. Hyperventilation and intermittent photic stimulation are activation procedures performed for inducing and recording physiological or pathological abnormalities. A period of EEG recording during sleep should be obtained. The stages of sleep include non-REM sleep (light sleep and deep sleep) and REM sleep. The analysis of EEG recording includes recognising the normality and avoiding over interpretation of the EEG.

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AOCN-0310
TC3: Epilepsy-EEG workshop -AOCN-ASEPA

EPILEPTIFORM DISCHARGES
J. Dunne[1]
[1], *Australia*
Whilst not as important as a good history, EEG is the most valuable diagnostic test for epilepsy. After first seizure EEG can assist in classification of seizure type (focal vs. generalised) and in assessing risk of recurrence. In established epilepsy, EEG can sometimes help clarify the epilepsy syndrome and guide the choice of treatment. However, interictal EEG cannot of itself make or exclude a diagnosis of epilepsy. An abnormal EEG with nonspecific findings does not mean the patient has epilepsy, and conversely the sensitivity of a single routine EEG (25-56%) is too low to reliably exclude the diagnosis. The usefulness of EEG depends on good quality recording and reporting. Adequate training is essential. Misinterpretation of many normal variants and artefacts commonly leads to misdiagnosis. Epileptiform activity has a number of defining features, of which morphology is the weakest and most unreliable. It is best to assume the EEG is normal and miss rather than misdiagnose epileptiform abnormalities: all sharp transients are normal variants or artefacts until proven otherwise. Once the diagnosis of epilepsy is established, there are few occasions when it needs to be repeated. In people with unexplained impairment of consciousness or behaviour, EEG may detect clinically unrecognised seizures or encephalopathy. In unconscious patients non-epileptic movements are very common, and their recognition by EEG prevents inappropriate overuse of antiepileptic drugs. EEG remains the first and only real-time monitor of epileptic seizures. Long term video-EEG monitoring has an important role in the minority of patients with diagnostic or management difficulties, and in evaluation for epilepsy surgery.

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AOCN-0360
TC4: NEUROSONOLOGY Workshop -Stroke updating and Hands on

ADVANCED APPLICATIONS OF TCD

V. Sharma[1]
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Transcranial Doppler (TCD) is the only non-invasive modality for assessment of real time cerebral blood flow. It complements various anatomic imaging modalities by providing physiological flow related information. It is relatively cheap, easily available and can be performed at the bedside. It has been suggested as an essential component of a comprehensive stroke centre. Apart from its importance in acute cerebrovascular ischemia, its role is expanding in the evaluation of cerebral hemodynamics in various disorders of the brain. The 'established' clinical indications for the use of TCD include cerebral ischemia, sickle cell disease, detection of right-to-left shunts, subarachnoid hemorrhage, periprocedural or surgical monitoring and brain death. In this section, we present the role of TCD in acute cerebro-vascular ischemia, sonothrombolysis, intracranial stenosis as well as other advanced applications.

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AOCN-0359
TC4: NEUROSONOLOGY Workshop -Stroke updating and Hands on

QUEST FOR EARLY RECANALIZATION IN ACUTE STROKE- DRUGS AND DEVICES

V. Sharma[1]
[1]*National University of Singapore, Neurology, Singapore, Singapore*

Ischemic stroke is one of the major causes of mortality and long-term disability. In the past, only few treatment options were available and considerable proportion of stroke survivors remained permanently disabled. However, the last 2 decades have witnessed rapid advances in acute stroke care. Since acute occlusion of an intracranial artery is responsible for the clinical manifestations, achieving timely recanalization remains the main aim of acute stroke care. Fast dissolution of the thrombi and arterial recanalization in acute stroke often leads to dramatic clinical recovery.

Thrombolytic therapy with intravenously-administered tissue plasminogen activator (IV-tPA) remains the mainstay in acute ischemic stroke. However, many interventional strategies have been attempted, with variable success, for rapid intracranial arterial recanalization and improve outcomes. In this review, the evolution of systemic thrombolytic agents and various interventional devices, their current status as well as some of the future prospects would be presented.

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AOCN-0354
TC4: NEUROSONOLOGY Workshop -Stroke updating and Hands on

AF AND NOACS

B. Chan[1]
[1], *Singapore*

Non-valvular atrial fibrillation (NVAF) is the major cause of cardioembolic stroke. Use of the CHA_2DS_2-VASc and HAS-BLED scores is recommended to access risks of stroke and anticoagulant related major haemorrahge before initiating long-term anticoagulant therapy.

Novel Oral Anticoagulants (NOACs), including a thrombin inhibitor (dabigatran) and three Factor Xa inhibitors (rivaroxaban, apixaban and edoxaban), is a new class of oral anticoagulants used for stroke prevention in NVAF. They provide similar efficacy in comparison to warfarin therapy with good INR control, and the added advantages of significant (<50%) reduction in risk of intracranial haemorrahge and less drug interactions, while regular blood monitoring for coagulation is not required.

Except for patients who have been on long-term warfarin therapy with excellent INR control, NOACs are likely beneficial in most NVAF patients for primary or secondary stroke prevention, including those who are newly started on anticoagulants. Choice of a particular agent and dose adjustments may be taken with regards to patient's age, body weight, renal function, history of GI bleeding, and concurrent medications which interact with P-glycoprotein and/or CYP3A4; and regular monitoring of renal function is recommended. NOACs are, however, contraindicated in patients with mechanical heart valves, and not recommended in rheumatic mitral valve disease.

Idarucizumab, a Fab fragment that specifically binds dabigatran, is recently approved for emergency reversal of the anticoagulant effect of dabigatran, and becomes the first line agent for treatment of dabagatran related haemorrhage, including intracranial haemorrhage (ICH); whereas prothrombin complex concentrates are the current agents of choice for acute reversal of Factor Xa inhibitor-associated ICH, and for dabaigatran-associated ICH when idarucizumab is not available.

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AOCN-0353
TC4: NEUROSONOLOGY Workshop -Stroke updating and Hands on

VARIOUS SCORING SYSTEMS IN ACUTE STROKE, WITH CRITICAL APPRAISAL OF NIHSS SCORING

B. Chan[1]
[1], *Singapore*

NIH Stroke Scale (NIHSS) is the most commonly used scoring system and a strong outcome predictor for acute ischaemic stroke (AIS). All physicians and nurses involved in the management of stroke patients should view the training videos, pass the assessment and use it in their daily practice in acute evaluation of AIS patients, particularly those eligible for emergency revascularization therapy, and for monitoring of these patients after treatment.

NIHSS, however, has some limitations including: 1. Inability to assess certain neurological deficits, such as distal limb weakness, gait impairment, hearing loss and mild cognitive impairment; 2. Bias towards left hemispheric strokes; 3. Scoring for mild facial asymmetry and non-specific numbness in stroke mimics.

In patients eligible for intravenous thrombolysis (IVT) within 4.5 hours of stroke onset, an NIHSS score ≤4 should not be used as the sole criterion to exclude treatment. Treatment is recommended especially if these patients have significant neurological deficits or major intracranial artery occlusions. For AIS patients with possible large artery occlusions, an NIHSS score ≥6-10 is sometimes used as a triage criterion for direct transfer to a comprehensive stroke centre and possible endovascular clot retrieval. However, NIHSS is not a satisfactory predictor of large artery occlusion and performance of a CTA, after non-contrast CT brain and initiation of IVT in eligible patients, remains the recommended management.

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AOCN-0330
TC4: NEUROSONOLOGY Workshop -Stroke updating and Hands on

CERVICAL DUPLEX- NORMAL EXAM

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Ultrasonography of the carotid arteries is a common imaging study for diagnosis of extracranial carotid artery disease. It is non-invasive, inexpensive test. Results and information from test should be reliable and reproducible.

The test provides information of carotid intima thickness, plaque, carotid stenosis and vertebral artery stenosis. The ultrasound physics of duplex is based on B-mode (Brightness) and Colour flow Doppler image.

The test starts with transverse B mode scanning. Transverse scanning allows identification of the common carotid artery (CCA) and jugular vein. The next step is to insonate along longitudinal plane, beginning with the most proximal segment of the common carotid artery, then carotid bifurcation, followed by internal and external carotid arteries. This is followed by colour flow.

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AOCN-0321
TC4: NEUROSONOLOGY Workshop -Stroke updating and Hands on

GROWTH OF NEUROSONOLOGY IN THE REGION

M.M. Mehndiratta[1]
[1], *India*

Stroke contributes substantially to the global burden of disability. Among the 15 million people worldwide who suffer a stroke each year, at least 5 million suffer long lasting disability. ISS is deeply concerned by the rising burden of stroke which is a consequence of evolving trends in demography and lifestyles.

Point-of-care ultrasonography is defined as ultrasonography brought to the patient and performed by the provider in real time.CEREBROVASCULAR ULTRASONOGRAPHY (Transcranial Doppler and Carotid vertebral Doppler) and PERIPHERAL NERVE and MUSCLE ULTRASONOGRAPHY. Point-of-care ultrasound images can be obtained nearly immediately, and the clinician can use real-time dynamic images, allowing findings to be directly correlated with the patient's presenting signs and symptoms. This is also referred to as ultrasound stethoscope.

TRANSCRANIAL DOPPLER / non-invasive Angiography of the intracranial Vessels (AMBULATORY) MOBILE DYANAMIC. The various indications for Doppler study are: *Cerebral Thrombolysis, Cerebral Microembolism Detection, Carotid Endarterectomy, Coronary Artery Bypass Graft (CABG) Surgery, Vasospasm after traumatic subarachnoid hemorrhage, Right-to-left cardiac shunts etc.*

Doppler is a Bedside diagnostic too, Noninvasive, Safe, and Reliable, Relatively non-expensive, Can be repeated multiple times, Can be usedfor continuous monitoring and Contrast agents are not required

Over the years TCD has expanded in its applications and currently, is the only tool for accessing cerebral hemodynamics in real time, the knowledge of which is a must for the Neurologist managing patients with cerebrovascular disorders.

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AOCN-0320
TC4: NEUROSONOLOGY Workshop -Stroke updating and Hands on

STROKE BURDEN IN EAST AND WEST- WHERE DO WE STAND AND WAY FORWARD

M.M. Mehndiratta[1]
[1], *India*

Stroke is responsible for more than 5.7 million deaths worldwide majority of which occurs in low and middle income country. As per WHO estimates in 1990 alone, 2.1 million Asians died of stroke. It is estimated that more than 60% of global burden of stroke happens in Asia. Though stroke is 2nd or 3rd leading cause of death in many countries while Stroke is the commonest cause of death in China.

Stroke in developing countries is slightly different as compared to US or European stroke patients. Average age of stroke patients in developing countries is 15 years younger than in developed countries. In developed countries 23% of deaths attributable to stroke were under age 70 while in developing countries 53% deaths attributable to stroke were under age 70. Young stroke account for 7-30% of stroke in some hospital based Asian studies.

Stroke types and causes of stroke may also be different in Asian population compared to the population in west. Asians have more hemorrhagic stroke then western countries. Extracranial carotid disease is less common and intracranial disease is more common in Asia. The prevalence of small vessel disease in young stroke patients is higher (20%) as compared to young stroke in western countries 13%. The frequency of Carotid dissection as the cause of stroke is low in Asians 7.6% as compared to 18% from a European study

High prevalence of cardiovascular risk factors especially valvular heart disease is alarming and should prompt to improved screening and treatment of rheumatic heart disease. Stroke guidelines in developing countries should address diagnostic and therapeutic strategies for young stroke patients. Patients with risk factor should be identified and primary prevention strategies should be applied. Future collaborative stroke research in developing Asian countries may help in identifying intervention strategies to lower the growing burden of stroke in Asia.

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AOCN-0397
CNS Infections

SARCOCYSTOSIS

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Human sarcocystosis is thought to be largely an asymptomatic infection. However, there are recent reports of 68 returning tourists from the Tioman island, off east coast of peninsular Malaysia in 2011-2012, with acute febrile myositis. Another large febrile myositis outbreak occurred in 2012 involved 89/92 (97%) of campers returning from Pangkor island, off west coast of peninsular Malaysia. The patients had relapsing fever and myalgia. About 10% had a delayed distinctive myositis of jaw muscle with facial swelling. Muscle biopsy identified *Sarcocystis nesbitti* as the aetiology cause for the first time in the muscle biopsies of 4 patients. Subsequently, *S nesbitti* was also identified in the muscle biopsy of one of the patients returning from the Tioman island. In the Tioman island outbreak, histopathology study of the muscles of 8 patients showed inflammation of varying severity, predominantly perivascular within the endomysium and perimysium with a wide range of severity. Sarcocysts were observed histologically in the muscle of 6 patients (40%). The serology test during the Pangkor outbreak was found to be insensitive. *S. nesbitti* DNA has also been found in the stools of snake in various parts of peninsular Malaysia, suggesting that it is the reservoir of the infection. Thus, *S. nesbitti* causes an acute, relapsing febrile myalgia with a high attack rate, with a distinctive myositis of the jaw muscle. Due to the transient nature of the symptom and difficulty of diagnostic confirmation, it may be a grossly undiagnosed cause of transient myositis.

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AOCN-0350
CNS Infections

CNS INFECTIONS IN SOUTH ASIA- A CHANGING LANDSCAPE

U. Ranawaka[1]
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Central nervous system (CNS) infections produce large numbers of death, disability and residual neurological sequelae. Early treatment has been shown to improve outcomes, but

appropriate early treatment can be challenging as it depends on rapid and accurate diagnosis. Clinical features are unreliable in arriving at a syndromic diagnosis or in detecting the underlying aetiology, and establishing the diagnosis is heavily dependent on laboratory investigations.

Management of CNS infections is especially challenging in resource-limited settings such as South Asia. Lack of modern diagnostic facilities, limited therapeutic options and high prevalence of antibiotic resistance are contributory to this. The disease burden of CNS infections is high in the region due to a combination of factors that facilitate disease spread, such as high population density, increasing air travel, urbanisation and favourable climatic conditions.

The landscape of CNS infections in South Asia may well be changing. While diseases traditionally considered 'tropical' such as tuberculosis and malaria continue unabated, it is pleasing to note that effective public health strategies are finally having some impact, as in polio eradication. Many other diseases, however, remain as causes of significant morbidity and mortality, e.g., rabies, typhus. Of particular importance is the emergence and re-emergence of vector borne diseases, such as dengue and West Nile virus infections. Hitherto unsuspected organisms (e.g., Bocavirus, Cyclovirus) have been implicated as potential causes of CNS infection in the region. Immune mediated encephalitis is likely to be an important contributor to the acute encephalitis syndrome, as in other parts of the world. A shift in focus in diagnostic evaluation and therapeutic intervention is required to meet the challenges faced by the changing landscape of CNS infections.

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AOCN-0319
CNS Infections

CNS INFECTIONS AND STROKE / NEUROCYSTICERCOSIS-CURRENT PERSPECTIVES

M.M. Mehndiratta[1]
[1], *India*

Stroke is the 2nd commonest cause of death worldwide responsible for 6.15 million deaths (10.8%). About 2/3rd of worldwide strokes occur in low and middle-income countries.

The risk factors and pattern of stroke are different in developing countries from those in developed countries. The majority of strokes are due to the traditional risk factors as hypertension, diabetes, obesity, smoking, alcohol addiction etc. However, in developing nations infections, nutritional deficiencies and tropical factors were responsible for small but significant number of strokes. The unusual stroke mechanisms specific or significantly more prevalent in the tropics include, sickle cell disease (Asia, Africa), cardioembolism due to Chagas disease (Latin America), arteritis secondary to cysticercosis (Latin America, Africa, Asia), intraparenchymal and subarachnoid hemorrhages due to leptospirosis (South America,

Asia), intracranial hemorrhages due to hemorrhagic enteric fevers (South America, Africa, Asia), vasculopathy due to neurobrucellosis (Latin America, and Middle East) cerebral infarctions and intracranial hemorrhages due to malaria (South America, Africa, Asia), vasculopathy. The other nontraditional factors associated with stroke seen worldwide but more prevalent in developing countries are opportunistic or coagulopathy due to HIV, vasculopathy due to CNS mycosis, vasculopathy and hemorrhagic stroke due to snake bite, stroke due to cerebral venous sinus thrombosis and cardioembolism due to rheumatic heart diseases and infective endocarditis. Apart from this Takayasu's Disease, Behcet's Disease and Moya Moya disease remain important causes of stroke in Asia especially Japan.

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AOCN-0377
Epilepsy 1-the Joint symposium of AOCN and CAOA: diagnosis and treatment of epilepsy

OPTIMISING TREATMENT OF EPILEPSY

S.H. Lim[1]
[1], *Singapore*

Management of patients with epilepsy focuses on three main goals: (1) achieving seizure-freedom or reducing seizure frequency, (2) avoiding treatment-related side effects, and (3) maintaining or restoring quality of life.

Optimal treatment can only be achieved following accurate diagnosis of epilepsy, objective measure of intensity, duration and frequency of seizures, and evaluation of disease-related psychosocial problems.

Selection of antiepileptic drugs (AEDs) must be individualized according to seizure type(s), epilepsy syndrome, AED's mechanisms of action and potential adverse effects, comorbidities, co-medication, age, life-style, learning disabilities, teratogenic potential, ability to adhere with the AED regimen, and toleration of formulation. Most important therapeutic considerations are *non-maleficence and beneficence*, using evidence-based medicine practise. Patient and family should, whenever, possible, take part in decision making.

About half of patients with epilepsy will be seizure-free on initial AED monotherapy. The other half will require further manipulation of their drug regimen. It seems sensible to substitute rather than combine when the first AED produces an idiosyncratic reaction, is poorly tolerated at a low or moderate dose, or produces no improvement in seizure control. Polytherapy may be preferred if patients tolerate their first or second AED well, but with a suboptimal response. There are several possible AED combinations based on different and multiple mechanisms of action and pharmacokinetic interactions.

Epilepsy surgery is a viable option for patients with surgically remediable syndrome. This requires comprehensive evaluation at specialized centre to identify suitable patients for resective surgery. Neuromodulation can be considered for patients in whom resective surgery cannot be offered.

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AOCN-0351
Epilepsy 1-the Joint symposium of AOCN and CAOA: diagnosis and treatment of epilepsy

ILAE CLASSIFICATION AND TERMINOLOGY OF EPILEPSY - CLINICAL IMPLICATION

A.A. Raymond[1]
[1], *Malaysia*

ILAE Classification and Terminology of Epilepsy: Clinical Implication

Owing to greater understanding of the aetiology and pathogenesis of epilepsy, the classification of epileptic seizures and epilepsy syndromes continues to evolve. Since it was first introduced by the ILAE in 1985, it has been revised once in 1989. In 2010, a new classification of epileptic seizures and epilepsy, which included a revision of the terminology of seizure types, was proposed, but is still not widely used. In 2013-2017, a commission was formed to refine the classification once more, and the ILAE is currently inviting its chapters to comment on the classification of seizure types within the broader organisational system. This is so that a final classification of seizures and epilepsy, which is clinically relevant, scientifically sound and flexible can be officially launched and used widely. Although the general framework of the seizure classification remains unchanged, certain terminologies have been replaced with more meaningful terms: “partial” has been replaced with “focal”, “simple” and “complex” with “aware, impaired awareness and unknown awareness”, and finally “secondarily generalised” with “bilateral tonic-clonic”. New seizure types have been added to the “generalised seizures” group. New terms to describe aetiology replace old terms to better reflect our knowledge about the cause of epilepsy: genetic (idiopathic), structural-metabolic (symptomatic) and unknown (cryptogenic). The additional terms “immune” and “infectious” have also been suggested. The other domain in the organisation of epilepsy includes the various electroclinical syndromes, categorised according to age of onset.

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AOCN-0390
Epilepsy 2-the joint Symposium of AOCN and CAOA : Epilepsy in Neurocritical Care

ILAE DEFINITION AND CLASSIFICATION OF STATUS EPILEPTICUS

G. Kalss[1]
[1], *Austria*

Status epilepticus (SE) is one of the most common neurological emergencies. It results either from failure of mechanisms responsible for seizure termination or the initiation of mechanisms that lead to an abnormal, long seizure. This first crucial time point is defined t1, whereas t2 represents the landmark when long term consequences have to be faced [Trinka et al, Epilepsia 2015].

In 2015 the ILAE Task Force on Classification of SE published a new definition and classification on SE [Trinka et al. Epilepsia 2015]. They pointed out four axis of classification: Semiology, etiology, EEG and age.

Axis 1, semiology is divided in subgroup A with prominent motor symptoms and B without prominent motor symptoms. Group B subsumes non convulsive status epilepticus (NCSE) without prominent motor symptoms. In the subgroup, the higher the structural brain damage is, the poorer is clinical outcome [Bauer et Trinka, Epilepsia 2010]. Among these seizures are those without coma, that subsume absences status or aphasic status and those with coma, what usually indicates brain injury.

Axis 2, etiology can be useful in terms of outcome prediction.

Axis 3, EEG takes localization, name of the pattern, morphology, time-related features, modulation and effect of medication on EEG pattern into consideration.

Axis 4 subsumes age dependant electro clinical syndromes.

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AOCN-0342
Epilepsy 2-the joint Symposium of AOCN and CAOA : Epilepsy in Neurocritical Care

CONTINUOUS EEG IN NEURO-ICU

J. Dunne[1]
[1], *Australia*

EEG is the first and only real-time monitor of epileptic seizures and is a powerful measure of cerebral function in the seriously ill. For EEG to be useful, many technical and environmental

challenges need to be overcome, and interpretation needs to be made within the clinical context by an expert reporter. In most patients a diagnostic EEG rather than continuous EEG (cEEG) monitoring is sufficient. Simultaneous recording of audio and video is required for recognising artefacts and stimulus-evoked changes. A black box with a few EEG channels and EEG signal processing is unhelpful.

Non-epileptic movements are very common is the critically ill, and EEG can provide helpful clarification when seizures are suspected. Different periodic EEG patterns form a continuum of non-seizure to seizure activity, and over-interpretation of these patterns may lead to inappropriate treatment and may harm patients. Whilst non-convulsive seizures and status epilepticus are commonly detected by cEEG in comatose patients, it is unknown whether these findings are contributing to or are simply reflecting outcome. Prognosis is determined by the underlying aetiology, with interventions having little or no effect except for patients with epilepsy. Unresolved questions include what EEG patterns should prompt aggressive treatment. EEG is an essential diagnostic and at times prognostic investigation in the critically ill, and ongoing refinements will lead to its more extensive use.

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AOCN-0379
Neurosciences (Current status in Stem Cell Therapy)

CORD LINING-DERIVED STEM CELLS AS A NOVEL SOURCE FOR NEURAL TRANSPLANTATION IN PARKINSON'S DISEASE

K.L. Lim[1], *C. Chai*[1]
[1]*National Neuroscience Institute, Research, Singapore, Singapore*

Cell replacement therapy holds tremendous promise for the treatment of Parkinson's disease (PD). However, the lack of a reliable and suitable source of donor cells has limited the widespread application of this treatment modality. The advent of induced pluripotent stem cell (iPS) technology has provided an unprecedented opportunity to circumvent this problem. Here, we have exploited the iPS technology to derive transgene integration- and feeder-free iPS from cells lining the human umbilical cord, an immunoprivileged organ that mediates interactions across the feto-maternal interface. Collectively designated as CLiPS (Cord Lining-derived iPS), these cells fulfill all the criteria for human pluripotent stem cells. Importantly, we demonstrated that CLiPS can be differentiated into dopaminergic (DA) neurons, the specific neuronal subtypes affected in PD. Transplantation of DA neuronal precursor cells (NPCs) into the brains of adult mice suggest that CLiPS-derived cells can survive in an immunocompetent host for up to one month in the absence of pharmacological immunosuppression. Further, in a unilateral neurotoxin (6-hydroxydopamine) lesion mouse model of PD, we found that transplanted CLiPs not only survived but also differentiated into mature DA neurons. PET imaging revealed significant restoration of dopamine reuptake in the CLiPS-engrafted animals. Additionally, behavioral tests using apormorphine-induced rotation assays showed recovery of asymmetric motoric deficits in CLiPS transplanted mice.

In summary, we provide evidence that CLiPS is a promising source of donor cells for allogeneic cell replacement therapy of PD.

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AOCN-0332
Neurosciences (Current status in Stem Cell Therapy)

STEM CELL THERAPY FOR ISCHAEMIC STROKE
K. Abe[1]
[1]*Okayama University, Okayama, Japan*

<Stem cell therapy for Ischemic Stroke and ALS>
Neuroprotection is essential for therapy in acute stage of stroke. Both NTFs and free radical scavenger can be such neuroprotective reagents with inhibiting death signals and potentiating survival signals under cerebral ischemia. For example, topical application of GDNF greatly reduced the infarct size and brain edema after middle cerebral artery (MCA) occlusion in rats. Edaravone, a free radical scavenger, is the first clinical drug for neuroprotection in the world which has been used from 2001 in most ischemic stroke patients in Japan. Edaravone scavenges hydroxyl radicals both in hydrophilic and hydrophobic conditions, and is especially useful in thrombolytic therapy with tissue plasminogen activator (tPA). Combination therapy of Edaravone with tPA greatly increased survival of stroke animals, reduced infarct size, and inhibited molecular markers of oxidative damage in lipid, protein and DNA. Use of Edaravone greatly reduced hemorrhagic transformation accompanied by tPA treatment,and may also extend therapeutic time window with tPA therapy for more than 4.5 hr in human stroke patients.

It is important for regenerative therapy that the neural stem cells which are intrinsically activated or exogenously transplanted. To support stem cell migration, an artificial scaffold can be implanted to injured brain for promoting ischemic brain repair. Addition of NTFs greatly enhanced an intrinsic migration or invasion of stem cells into the scaffold, which could provide a future regenerative potential against ischemic brain damage at chronic stage. G-CSF may promote bone marrow cell migration into ischemic brain to reduce such a damage. In vivo optical imaging is a recent technology to detect ischemic and other neurologic disorders without killing subjects, which make able time-dependent monitoring of the disease conditions such as MMP9 activation and macroautophagy. Transient increase of such in vivo optical images were detected from living mice brain after ischemic stroke and ALS model mice. Macroautophagy image was also obtained in mice model of motor neuron disease ALS from the back of the animal. We report a cell therapy for both ischemic stroke and ALS model mice.

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AOCN-0374
Plenary 1 - Global Neurology Symposium- Training and education in Neurology, way to move forward

ASIAN INITIATIVE
R. Kaji[1]
[1]*Tokushima University, Neurology, Tokushima, Japan*

Perspective: Asia Initiative
Ryuji Kaji
Asia is rapidly exploding in population and economy, and facing unique problems not experienced by other regions. Among these, the accelerated aging of the populatioPerspective:Asia Initiativen brings neurologic disorders such as stroke and Alzheimer disease to the forefront. The projected increase of the population over 65 years among nations. While Western countries have a linear increase of the aged over years, Asian countries (Japan, Korea, and China) have S-shaped curves indicating a steep surge of the aged population during 2000–2020 (Japan) and 2020–2030 (Korea and China). India will probably join this group by the end of this century.
Because of their increasing number, stroke survivors are now being called “people with stroke” rather than “stroke patients” in Japan. Despite social recognition of the disabled, the

infrastructure for people with stroke is still inadequate. To meet these needs, universal design has become the key goal for housing, automobiles, and other industries. The Japanese Society of Neurology has pledged to promote neurorehabilitation with robotics. These social changes are expected to be seen in other Asian countries in the near future.

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AOCN-0318
Plenary 1 - Global Neurology Symposium- Training and education in Neurology, way to move forward

ASIAN-OCEANIAN
M.M. Mehndiratta[1]
[1], *India*

Neurologic Training and Education in Asian and Oceanian region: Way to move forward

Man Mohan Mehndiratta

Director, Professor & HOD, Department of Neurology, Janakpuri Superspecialty Hospital, Janakpuri, New Delhi-110058

The Asian subcontinent and Oceania are together home to more than 60% of the world's population. Burden of

Neurological disease and sickness is thereby higher and medical care is much in demand. There exist many

developing countries with diverse cultural, economical, political, religious and historical backgrounds within the Asian and Oceanian region. In recent times enhanced medical care in these developing countries has led to

improvement in longevity that has increased the burden on those providing health care. The prevalence of

neurological illness has also increased and has emerged as priority health problem.

Government and private investment in the health sector and training of medical graduates remains an important

aspect of health care, as it greatly assists in provision of services to the ever growing population. One of the

indicators of health financing which summarizes national (government and private) expenditure on health in a

given year is total expenditure on health as percentage of GDP (Gross Domestic Product). Poor economic growth has led to less budget allocation to the health care sector in the Asian and Oceanian region and developing countries have a long way to go in order to be at par with the western developed world in provision of Neurologic care. The gap is widened by the lack of Emergency medical teams, 911 providers, and ability to treat patients with clot busters such as intravenous recombinant tissue plasminogen activator (IV rtPA) to name few.

Conclusion: Cooperation amongst governmental, international and national neurology organizations can facilitate establishment of a structured format of neurology training within the Asian and Oceanian region thereby standardizing the quality of neurology trainees worldwide and improve quality of patient care. Simultaneously the quality of the healthcare infrastructure requires up gradation.

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AOCN-0391
Stroke (WSO) 2

CASE STUDY- UNIVERSITY OF MALAYA
M.I. Idris[1]
[1]*University Malaya Medical Center, Neurology, Kuala Lumpur, Malaysia*

Dr Imran will be discussing the clinical features and management of vascular dementia in patients he has encountered at the University Malaya Medical Center.

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AOCN-0378
Stroke (WSO) 2

VASCULAR COGNITIVE IMPAIRMENT : CURRENT MANAGEMENT
C. Chen[1]
[1]*Yong Loo Lin School of Medicine- National University of Singapore,*

Department of Pharmacology, Singapore, Singapore

Stroke is a leading cause of death and disability worldwide. Despite improvements in acute stroke treatment, many patients only make a partial or poor recovery, including in terms of cognition. The concept of vascular dementia (VaD) has evolved since the 1960s, with several sets of diagnostic criteria having been published. Much ambiguity in the definition of VaD continues to beset the field, which warrants a critical examination and updating of the extant criteria. The traditional concept of vascular dementia, reflected in the earlier term multi-infarct dementia, has been expanded to include a wide range of syndromes. Nevertheless, it is increasingly recognised that the conventional definition of vascular dementia is deficient as stroke may produce a spectrum of cognitive changes, thus the emergence of "vascular cognitive impairment" (VCI) as a more clinically useful syndrome. Patients with VCI have been reported to be as common as those with Alzheimer's Disease and have a significantly higher rate of institutionalisation and death.

Indeed, a substantial proportion of patients after non-disabling stroke are cognitively impaired compared to aged and education matched community dwelling controls. Our group has shown that severity of baseline cognitive impairment after stroke is associated with an increased risk of incident dementia as well as poorer functional outcome. We have also explored several novel imaging and blood biomarkers for VCI.

Advances in stroke management, and the recognition of the co-existence of vascular dementia and Alzheimer's disease have opened new prospects for the prevention and treatment of VCI.

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AOCN-0367
Stroke Symposium (APSO) 1

SOUTH ASIA
M.M. Mehndiratta[1]
[1]*, India*
Asia Oceania region has a population of approximately 4.2 billion which is almost 60% of world population. South Asia holds world's highest population of approximately 1.749 billion and Oceania holds a total population of 35.7 million. Majority of the countries in this region are developing countries with low and middle income population.These countries are in different stages of epidemiological transition exhibiting social, cultural and economic change. Increasing globalization, urbanization and ageing population can bestroketsunami harbinger in this region. Apart from these, additional elements in this region include poverty, stress and hereditary factors. Thus the burden of neurological disease such as stroke is on a rise in South Asia and Oceania region. The burden is determined by epidemiological investigations such as studies related to distribution and determinants of stroke and certain indicators such as health care delivery, health care providers, knowledge and information, prompt treatment, funding and governance. Monitoring and measuring the burden of stroke

and its application to control its incidence and prevalence is critical globally, especially in Asian Oceania countries.

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AOCN-0401
Botulinum Toxin Workshop- Sponsored by Merz

E. Lim[1]
[1]*National University of Singapore, Medicine, Singapore, Singapore*

Benefits derived from the injection ofbotulinum toxin (BoNT) may be negated by unintended weakness of uninjected muscles, either due to diffusion or, more commonly, physical spread.

Performance of BoNT injections may be relatively facile, requiring only surface marking or clinical localization techniques or may be more technically demanding, necessitating special targeting techniques such as electromyography (EMG), imaging in the form of ultrasonography (U/S),

fluoroscopy or computed tomography (CT), or endoscopy.

While there is evidence to support the efficacy of BoNT injections in treating many conditions, there is little or no evidence to support the superiority of any one injection technique over muscle localization using surface anatomy. This may be due to the lack of well-designed controlled studies, as current studies are limited by small numbers of patients, lack of consistency of injection

technique, and the application of different rating scales. Intuitively, certain injection techniques are more suited to injection of specific muscles or conditions. For example, U/S or passive-monitoring EMG should be used when treating cervical dystonia, and active-monitoring EMG applied for strabismus injections, whereas either active-monitoring EMG or endoscopy is indicated when administering BoNTfor spasmodic dysphonia. Finally, electrical stimulation, EMG, or U/S (or a combination of EMG and U/S) is most suitable when injecting the forearm muscles for spasticity or writer's cramps. In this session, we will examine different localization techniques and discuss the reasons for using one rather than another, in the treatment of neurological conditions

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AOCN-0388
Headache Symposium

UPDATE ON CHRONIC MIGRAINE

S.J. Wang[1,2]
[1]*National Yang-Ming University School of Medicine, Faculty of Medicine, Taipei, Taiwan*
[2]*Taipei Veterans General Hospital, Neurological Institute, Taipei, Taiwan*

Chronic migraine is a highly disabling neurological disorder defined as a headache with frequency of ≧15 days per month for ≧3 months, in which ≧8 days are migraine attacks or responsive to migraine-specific treatment (International Classification of Headache Disorders, 3rd edition (beta version), 2013). The population prevalence of chronic migraine is about 2%. It is the most common diagnostic entity in headache clinics and many patients with chronic migraine overused abortive medications including ergotamine, triptans, analgesics or narcotics. Patients with chronic migraine have worse socioeconomic status, reduced health-related quality of life, increased headache-related burden and greater psychiatric and medical comorbidities in comparison with episodic migraine. The exact underlying pathophysiology of chronic migraine has not been fully understood, but impaired descending pain modulatory pathways, central sensitization, cortical hyperexcitability or disinhibition, and neurogenic inflammation have been implicated. Our studies using magnetoencephalography showed a continuous ictal-like brain excitability in chronic migraine.

A detailed history taking and neurological examination are important for the diagnosis of chronic migraine. Secondary headache disorders should be excluded before making the diagnosis. Routine neuroimaging studies are not supported by evidence. A headache diary is both helpful for diagnosis and follow-up. Psychiatric comorbidity especially depressive and anxiety disorders are very common in patients with chronic migraine. Withdrawal of overused abortive treatment has been suggested for those with medication overuse; however, whether prophylactic agents should be given at the same time or after withdrawal is still under debate.

Patients with chronic migraine usually are excluded from migraine prophylaxis trials because they are considered to be too highly disabled and treatment resistant. However, there are a substantial amount of these patients, and indeed, they are the patients who imperatively require effective, safe, and well-tolerated headache prophylactic therapy. OnabotulinumtoxinA and topiramate have evidence for chronic migraine. Recent clinical trials suggest flunarizine, CGRP monoclonal antibody and some neuromodulation technologies might also be effective.

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AOCN-0386
Headache Symposium

ALTERNATIVE TREATMENT IN HEADACHE

S. Chankrachang[1]
[1]*, Thailand*

Alternative treatment in headache

While modern medical science promotes the thirst for “new science” ancient medicine still values human experience as the cornerstone for health and the key for preventing and treating disease.

Headache is the most common problem in neurology and yet still require comprehensive treatment plans. These include education, reassurance and life style modification, voiding triggers to prevent attack , pharmacologic treatment non-pharmacologic treatments in treating the acute attack, long-term preventive therapy.

In Asia alternative management of headache has been explored increasingly and tremendously during the past ten years. These include meditation acupuncture and massage.

Majority of headache sufferers had improvement of headache symptoms after acupuncture therapy. Acupuncture treatment in our experience was a good alternative choice of therapy of headache with minor side effect

Thai traditional massage has also effects the pain threshold and headache intensity in patients with chronic tention type headache and also migraine.

Meditation has been extensively practiced in many civilizations for thousands of years as a means of cultivating a state of well-being and for religious purposes. It has now started to be studied in terms of its influence on the brain and body and used in clinical settings.

Meditation in headache and pain has been studied extensively during the past 5 years and the effect is just like massage since it can increase the pain threshold and reduce intensity of pain.

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AOCN-0380
Headache Symposium

TRIGEMINAL AUTONOMIC CEPHALAGIAS
C. Siow[1]
[1], *Singapore*

Trigeminal autonomic cephalgias are a rare form of primary headache disorders. In this talk I will explore the various trigeminal autonomic cephalgias which we will have knowledge of. I will go through the the diagnosis of the various headaches in this group as well as diagnostic pitfalls to be avoided. Treatment options will also be covered specifically the latest interventional options available to us today.

At the end of this talk the participant should be able to comfortably diagnose the more common TACs and also treat this group of headache disorders competently.

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AOCN-0317
Headache Symposium

MENSTRUAL MIGRAINE AND ITS MANAGEMENT
Y. Idu Jion[1]
[1]*National Neuroscience Institute, Neurology, Singapore, Singapore*

Migraine commonly affects women. Hormonal influences play a role in the pathophysiology of migraine in women, particularly after puberty, during child-bearing years and at menopause. In this session, we will focus on epidemiology of menstrual migraine, its pathophysiology and overview on treatment options.

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AOCN-0387
Movement Disorder 1-

MOVEMENT DISORDERS IN INFECTIVE & INFLAMMATORY CONDITIONS
R. Bhidayasiri[1]
[1]*, Thailand*

Infectious disorders, including HIV may affect the extrapyramidal system by means of different mechanisms and express themselves clinically by abnormal movements. Viral, bacterial, fungal or parasitic agents can compromise the system by a direct effect or as an acquired autoimmune process. Not uncommonly, a given infectious agent may induce more than one type of abnormal movement by more than one mechanism. A good example involves patients with HIV/AIDS who frequently develop hemichorea-hemiballism due to a direct involvement of the opportunistic infections in the contralateral basal ganglia while opsoclonus-myoclonus syndrome may develop as part of an immune reconstitution syndrome. In contrast to a previous belief that influenza virus directly responsible for the outbreak of encephalitis lethargica (EL), current evidence suggested that EL and EL-like illness is part of a spectrum of post-streptococcal autoimmune diseases, as a result of the detection of antibasal ganglia antibodies. Similarly, the pathogenesis of Sydenham's chorea is probably autoimmune, associated with the presence of antineuronal antibodies. During the session, the author will review some particularities of movement disorders related to specific

HIV and other infectious agents, posing different mechanisms involved. Many more examples will be discussed in the chapter.

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AOCN-0368
Movement Disorder 1-

PARKINSON'S DISEASE - BASIC SCIENCE ASPECTS
E.K. Tan[1]
[1], *Singapore, Singapore*

Parkinson's disease (PD) is a common neurodegenerative disease. With aging of the population, its incidence is likely to increase.
PD has complex etiologies. Traditionally, the condition is called "Idiopathic" when no secondary causes are found. Parkinsonism can be a result of various secondary etiologies such as infection, drugs etc.

The relative contribution of genetic and environmental factors in PD has been debated. To date many genes have been identified to cause PD and many environmental and lifestyle factors (smoking, caffeine intake, pesticides etc) linked to the condition.

Regardless of the etiology, the pathology and molecular events that underpin PD are fairly similar. Studies have shown that oxidative stress, ubiquitin proteasome system impairment, unfolded protein stress and mitochondrial dysfunction are the pathological hallmarks of the disease. This has been supported by human post mortem studies and in various experimental animal models.

A concise summary of the clinical etiologic factors and molecular events that are associated with PD will be discussed

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AOCN-0364
Movement Disorder 1-

WHAT NEUROLOGISTS NEED TO KNOW ABOUT WILSON'S DISEASE
K.B. Bhattacharyya[1]
[1]*India*

In the year 1912, Samuel Alexander Kinnier Wilson of England, working in Queen Square, London, wrote one paper in the journal Brain that ran for 215 pages. Also known as hepatolenticular degeneration, it is an autosomal recessive disease where copper accumulates in various tissues, particularly, in the brain, liver, kidneys, and the eyes.

Copper is a co-factor for the functioning of a number of enzymes. It is obtained from diet and absorbed through the small bowel by a transporter protein, copper membrane transporter 1, (CMT1). Copper is then delivered inside the cells, where it is bound to metallothionein and a part is carried by anti-oxidant protein 1, or ATOX1, a copper metal-binding protein, to trans-Golgi network. As cellular copper concentration increases, the enzyme ATP7A releases copper into the portal vein, where it is carried to the liver and the hepatocytes carrying CMT1 and ATOX1 bind copper inside the cell by the mediation of ATP7B, which links copper to ceruloplasmin and releases it into the blood stream and removes excess copper as well, in the bile. These two functions of ATP7B are impaired in Wilson's disease and copper accumulates inside the hepatic tissue and ceruloplasmin, though secreted is free from copper which is known as apoceruloplasmin. When the liver is exhausted with deposit of copper, oxidative damage takes place, leading to chronic active hepatitis, cirrhosis, and even fulminant hepatic failure. Free copper is released from liver and gets deposited in the eyes, kidneys and most importantly, in the putamen, globus pallidus, and cerebral cortex. Deposits in these critically important areas for movement and the cortical function lead to the neuropsychiatric manifestations of Wilson's disease.

Wilson's disease is caused by mutation in the ATP7B gene, located in chromosome 13q14.3. In 1% of normal subjects a single abnormal copy of the gene is present who remain asymptomatic as carriers. However, inheritance from both the parents leads to the development of the disease and the usual age of onset is between 6 to 20 years. Its incidence is 1 to 4 per 100,000 people.

The hepatic manifestation may be in the form of chronic active hepatitis, cirrhosis, or fulminant hepatic failure the usual clinical presentation is jaundice or portal hypertension and subsequent hematemesis. The neuropsychiatric manifestations consist in cognitive decline and behavioural abnormalities. Parkinsonian features, wing-beating tremor, dystonia, apraxia and seizures are commonly seen. Psychosis, depression and anxiety can be the prominent psychiatric symptoms. The characteristic Kayser- Fleischer rings on the cornea is a pathognomonic sign and posterior subcapsular sunflower cataracts may be seen. Renal involvement often leads to renal tubular acidosis, phosphaturia and aminoaciduria. In India, Wilson's disease often has osseomuscular presentation with wasting of proximal muscles of shoulder and pelvic girdle and osteomalacia. The calf muscles are often hypertrophied and therefore it may masquerade as childhood muscular dystrophy. Indian childhood cirrhosis is sometimes the terminal manifestation.

The diagnosis of Wilson's disease is established on the basis of abnormal liver function test, decreased serum ceruloplasmin (less than 20 mg %), increased urinary copper excretion level (more than 100 μg in 24 hours) and liver biopsy for copper assay (more than 250 μg of copper in gram of dry liver tissue). Magnetic resonance imaging of the brain shows hyperintensity of the lentiform nucleus in T1-weighted image and the T2-axial cut shows the characteristic 'face of the giant panda' in the midbrain.

Treatment consists in diet which is low in copper content. Zinc sulphate stimulates metallothionein, a protein in intestinal cells which binds to copper by competitive inhibition

and limits its absorption. Penicillamine is an effective drug which chelates to copper and induces cupriuresis. Early complications are renal and bone marrow failure while lupus-like syndrome and myasthenia gravis are troublesome late complications. Trientine and tetrahydromolybdate are other expensive agents. Hepatic transplantation is an alternate modality of treatment in fulminant hepatic failure variety.

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AOCN-0382
Movement Disorder 2

DBS FOR MOVEMENT DISORDERS - A TOUR WITH CASE VIGNETTES
B. Jeon[1]
[1], *Republic of Korea*

In this presentation, classic and didactic cases of DBS will be presented. PD, dystonia and tremor will be included. Presentation will encourage interactive discussion.

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AOCN-0371
Movement Disorder 2

MOVEMENT DISORDERS NEUROIMAGING FOR THE CLINICIAN
P.K. Pal[1]
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Neuroimaging is one of the most useful investigations in a patient with Movement Disorder. The most commonly used neuroimaging method in Movement Disorders is Magnetic Resonance Imaging (MRI) followed by other imaging modalities such as functional imaging (DAT and PET scans), CT scan and transcranial ultrasound.

A 3.0 Tesla MRI with standard (T1, T2, DWI, MRS, etc.) can provide useful information of cortical and subcortical structural changes in various chronic and acute movement disorders. While presence of characteristic imaging features can be diagnostic of certain disorders, absence of specific features is also helpful to rule out specific disorders. Distinct signal abnormalities in specific areas and the degree and pattern of atrophy are most useful features for diagnosis of various Movement disorders. MRI can show characteristic imaging features in some of these chronic disorders such as (i) neurodegeneration with brain iron

accumulation (eye-of-the tiger sign), (ii) Wilson's disease (giant panda sign), (iii) neurometabolic disorders such as glutaric aciduria, (iv) mitochondrial disorders (e.g. Leigh's disease), (v) Fragile-X syndrome (hyperintensity of superior cerebellar peduncles), and in (vi) various chronic progressive cerebellar disorders such as ARSACS, SCA-2, etc. Specific changes on MRI are also often seen in toxic disorders such as manganese toxicity, methanol poisoning, etc. MRI findings are useful in diagnosis of mitochondrial disorders, organic acidurias, disorders resulting from metal deposition (Fe or Cu), toxic, infective (e.g. Creutzfield-Jacob Disease, Japanese encephalitis) and immune-mediated disorders such as auto-immune encephalitis.

While routine MRI is not diagnostic in idiopathic Parkinson's Disease (PD), specific patterns of atrophy of cortical and subcortical structures may be useful in distinguishing it from certain disorders causing secondary parkinsonism such as normal pressure hydrocephalus (ventricular dilatation out of proportion to cortical atrophy, prominent CSF flow changes in the region of aqueduct), vascular parkinsonism (multiple infarcts and white matter signal changes), postencephalitic parkinsonism (basal ganglionic and deep gray matter signal changes as seen in Japanese encephalitis), parkinsonism secondary to manganese toxicity (T1 pallidal hyperintensity), structural lesions (such as tumours) in basal ganglia and dural arteriovenous fistula, etc. Several Parkinson plus disorders can also have characterstic features such as multiple system atrophy (hot-cross bun sign, putaminal atrophy) and progressive supranuclear palsy (predominant midbrain atrophy producing penguin sign, morning-glory sign), Recently a few studies have investigated the role of nigrosome 1 imaging using t2*gradient MRI and neuromelanin sensitive MRI. These newer techniques appear promising and may prove useful for diagnosis of idiopathic PD. SPECT and PET may be useful in differential diagnosis of idiopathic PD versus Parkinson plus disorders, but these investigations are costly and not easily available.

In summary, MRI is currently the most useful and easily available neuroimaging modality for a clinician to evaluate patients with movement disorders.

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AOCN-0395
Multiple Sclerosis (PACTRIM) 1-Classic Multiple Sclerosis

UPDATE ON PATHOGENESIS
K. Fujihara[1]
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Multiple sclerosis (MS) is an inflammatory demyelinating disease with multiple CNS lesions disseminated in time and space. Multiple genetic (ethnicity, HLA-DRB1, helper T cell-related factors, etc) and environmental factors (early seroconversion to EB virus, vitamin D deficiency, cigarette smoking, etc) are involved in the pathogenesis of MS, but each one has a modest effect at best. Immunological derangements involving both innate & adaptive,

humoral & cellular immunities along with disrupted blood-brain-barriers (BBB) are primarily responsible for the development of inflammatory demyelination in the CNS, and the therapeutic efficacy of disease modifying drugs and neuroimaging studies (MRI, OCT, etc) have provided clues to the essential pathomechanisms of relapsing MS. CNS cellular responses also play critical roles (Brain plasticity and remyelination occur in the early phase of disease, but neuronal damage insidiously develops from the beginning.) Despite accumulated knowledge, triggers of relapse remain unclear. Although our understanding of progressive MS has been limited, recent research has identified potential mechanisms (neurodegeneration, BBB compartmentalization, B cell immunity, etc) underlying progression. This presentation will aim for providing an overview of most recent evidence of MS pathogenesis.

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AOCN-0394
Multiple Sclerosis (PACTRIM) 1-Classic Multiple Sclerosis

TREATMENT OF THE HIGHLY ACTIVE CASES

W. Carroll[1]
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Objective: To review the treatment of highly active multiple sclerosis (MS).

Method: To discuss highly active MS in the Asian and Oceanian region and it's diagnosis and treatment.

While there is no universal consensus as to what constitutes highly active disease, a fundamental aspect is the presence of continuing disease activity either clinically evident by relapse and the accumulation of disability or evidence of accumulating inflammation by MRI or both over a relatively short period of time, whether on treatment or not.

Intrinsic to these features is that highly active disease is seen in the context of relapsing and remitting MS. Clearly the facility by which highly active disease can be identified depends on the services available to the clinician and which are known to vary widely through the Asian and Oceanian region. In the same way the means to arrest the activity of the disease and the accumulation of disability in both the short and long term resides with the accessibility of the more effective treatments.

These issues will be discussed in terms of optimum surveillance, accessible therapeutic intervention and the relative efficacy of disease suppression.

Conclusion: No matter what the situation comprises with respect to facilities, expertise and accessibility to treatments the single most important goal is constant; to limit ongoing acute injury and the likely priming of the CNS to later progressive injury. Those with highly active MS just have a more urgent requirement.

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AOCN-0347
Multiple Sclerosis (PACTRIM) 1-Classic Multiple Sclerosis

EARLY TREATMENT
A. Kermode[1]
[1], *Australia*

The natural history of multiple sclerosis may be clinically heterogeneous but it is ultimately characterized by progression of disability. MS is life shortening and large natural history registries have demonstrated that the main cause of death in MS patients is MS itself. Fortunately the last 20 years have witnessed major advances in MS research and therapeutics, and now we have numerous treatments proven to modify the natural history of the disease. Crucially however our existing therapies must be given early in the disease for maximum efficacy. Time is brain, and what is lost cannot currently be regained. This lecture will review the compelling evidence supporting early therapeutic intervention in MS, contemporary proven MS therapies, and provide an update on recent exciting advances in management.

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AOCN-0398
Multiple Sclerosis (PACTRIM) 2--Multiple Sclerosis Related Disorder

IMAGING OF AQP4 POSITIVE PATIENTS
C.T. Tan[1]
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The recently introduced International Consensus diagnostic criteria for the diagnosis of neuromyelitis optica spectrum disorder (NMOSD) include patients who are seronegative for AQP4 antibody. The criteria are based on MRI change said to be specific in the spinal cord, optic nerve and brain. They are, in the spinal cord, longitudinally extensive transverse myelitis (LETM), with Increased signal on T2W images extending > 3 complete vertebral

segments, and central cord predominance (>70% within central gray matter. The changes in the optic nerve are bilateral optic nerve lesion and posterior nerve predominance, especially extending into the optic chiasma. The changes in the brain are lesions involving the dorsal medulla, especially area postrema, or contiguous with the upper cervical cord; lesions in the periependymal surfaces of the 4th ventricle or 3rd ventricle involving the hypothalamus or thalamus; large, confluent subcortical deep white matter lesion; long corticospinal tract lesions; and extensive periependymal lesion surrounding the lateral ventricle. Such specific location of lesion is consistent with the pathogenic role of antibody against AQP4, which is water channel particularly abundant in the ependymal cells. However there are discordant data, particularly from the Malaysian and Thai patients, showing that the specificity of these changes may vary with ethnicity of the patients.

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AOCN-0396
Multiple Sclerosis (PACTRIM) 2--Multiple Sclerosis Related Disorder

THE IMPLICATIONS OF NEW DIAGNOSTIC NMOSD CRITERIA

K. Fujihara[1]
[1]*Fukushima Medical University, Department of Multiple Sclerosis Therapeutics, Koriyama, Japan*

More than a century has passed since the first report of neuromyelitis optica (NMO). The discovery of NMO-specific aquaporin-4 (AQP4)-IgG has truly accelerated clinical and experimental research of NMO, and contributed to establishing "NMO spectrum disorders (NMOSD)", a wider clinical spectrum than a typical severe opticomyelitis in the original description.

Until the Wingerchuk's diagnostic criteria of NMO proposed in 2006, both optic neuritis and acute myelitis were required for the diagnosis. However, along with the advancement of our understanding of the disease, the diagnostic criteria of NMO have evolved. The International Panel on NMO Diagnosis has recently published the new diagnostic criteria of NMOSD (NMOSD is the unifying term.). The new criteria are essentially based on AQP4-IgG serostatus (1. NMOSD with AQP4-IgG and 2. NMOSD without AQP4-IgG or with unknown serostatus) and core clinical characteristics of NMOSD, namely, optic neuritis, acute myelitis, and area postrema and some other brain syndromes, although alternative diagnoses should be carefully ruled out. Unlike AQP4-IgG-positive NMOSD requiring only one core clinical feature, two or more clinical characteristics are needed for diagnosing NMOSD in cases without AQP4-IgG or those with unknown serostatus, but we need to be careful that this group may be heterogeneous. In fact, a fraction of patients with seronegative NMOSD are positive for myelin oligodendrocyte glycoprotein (MOG)-IgG and have some unique clinical, MRI and laboratory features.
The new diagnostic criteria of NMOSD are expected to facilitate the early diagnosis and treatment decision, but allow for future revisions, especially in seronegative NMOSD.

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AOCN-0366
Multiple Sclerosis (PACTRIM) 2--Multiple Sclerosis Related Disorder

TREATMENT-SUPPORTED BY PACTRIMS
S.H. Kim[1]
[1], *Republic of Korea*

Current approaches for the treatment of neuromyelitis optica spectrum disorder

Neuromyelitis optica spectrum disorder (NMOSD) is a rare and severe central nervous system inflammatory disorder, characterized by attacks of optic neuritis, longitudinally extensive transverse myelitis, or area postrema syndrome. Over the last decade, NMOSD has gained increasing attention after the discovery of disease-specific autoantibodies directed against aquaporin-4 (AQP4). While its pathogenesis has not been fully elucidated, NMOSD is now considered an anti-AQP4 antibody-mediated autoimmune astrocytopathic disease in which clinical and magnetic resonance imaging findings, and therapeutic responses are distinct from those observed in multiple sclerosis (MS) patients. The clinical disabilities associated with NMOSD are exclusively attack-related and, thus, the primary treatment goal is the prevention of relapse. To date, no medications have been specifically approved to treat NMOSD; however, various immunosuppressive regimens have been reported to be effective in the attenuation of attack severity as well as in reducing relapse episodes. Currently, rituximab has the strongest evidence to support its use, demonstrating long-term efficacy and an acceptable safety profile in NMOSD, and it is widely used for patients with relapse receiving other immunosuppressive therapies. Retrospective case series data for azathioprine, mycophenolate mofetil, methotrexate, and mitoxantrone have also demonstrated a reduction in annualized relapse rate and stabilization of expanded disability status scale scores. However, despite the use of immunosuppressive treatment, some patients undergo relapse. Furthermore, the safety issues of long-term immunosuppression are unresolved. Several trials of new biologic therapies such as monoclonal antibodies against complement protein C5 (Eculizumab), anti-interleukin-6 receptor antibody, or anti-CD19 antibody are currently underway. Results from these studies will hopefully help guide future management decisions.

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AOCN-0327
Multiple Sclerosis (PACTRIM) 2--Multiple Sclerosis Related Disorder

PATHOGENESIS OF NMO AND MOG
S. Kuwabara[1]

[1], *Japan*

Anti-aquaporin-4 (AQP4) antibodies are important diagnostic biomarkers and pathogenic factors for neuromyelitis optica (NMO). However, AQP4-IgG are absent in approximately 10-20% of clinically suspected NMO or NMOSD patients. Recent studies have shown that anti-myelin oligodendrocyte glycoprotein (MOG) antibodies can induce an NMO-like disorder, and MOG might be an autoantigen in AQP4-negative NMO. Since 2011, over 100 anti-MOG-positive patient with NMO-like syndrome have been reported using a cell-based assay. Separately high-titer autoantibodies were mainly detected in pediatric acute disseminated encephalomyelitis (ADEM), their role in NMO and NMOSD remains unresolved. Patients with anti-MOG antibodies represented about 20% of NMOSD patients negative for AQP4 antibodies, clinically characterized by more frequently male, a restricted phenotype (bilateral simultaneous optic neuritis than myelitis), and spinal cord lesions distributed in the lower portion of the spinal cord. Usually recovery is better than AQP4-positive patients, and course is often monophasic. NMO-like syndrome with anti-MOG antibodies is likely to represent a new disease entity causing demyelination preferentially affecting the optic nerve and spinal cord, or may be a limited form of ADEM.

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AOCN-0340
NCS/EMG workshop (Those registered for the Neuromuscular US workshop will have free access to this workshop also, However delegates must register to this workshop)

ELECTRODIAGNOSIS OF NEUROMUSCULAR TRANSMISSION DISORDERS

Y.L. Lo[1]
[1]*National Neuroscience Institute, Department of Neurology, Singapore, Singapore*

Electrodiagnosis of Neuromuscular Junction Disorders

YL Lo

National Neuroscience Institute

Singapore General Hospital

Duke-NUS Medical School

Electrodiagnosis of neuromuscular transmission defect (NMTD) is based on biochemical properties at the presynaptic, synaptic and postsynaptic regions. Apart from history, clinical

examination, the ice and edrophonium tests, they provide additional value if performed with good technical expertise.

Repetitive nerve stimulation (RNS) is a non-invasive and readily available test for NMTD. Positive decremental responses are of low sensitivity but higher specificity for postsynaptic NMTD. High frequency RNS may elicit incremental responses in presynaptic NMTD, but is less well tolerated than the use of post-exercise facilitation of compound muscle action potentials.

Single fiber electromyography (SFEMG) measures jitter either during slight voluntary contraction (volitional SFEMG) or by axonal stimulation (stimulated SFEMG). Jitter is expressed as the mean of the absolute consecutive differences (MCD) of the latency between the time-locked potentials (volitional SFEMG) or from the stimulus to the negative peak or rising slope of the potential (stimulated SFEMG). An increased jitter value is not specific for myasthenia gravis or myasthenic syndromes, because may be due to unstable conduction in motor nerves, muscle fibers, as well as other conditions interfering with neuromuscular transmission.

These techniques will be demonstrated and discussed, within the context of a comprehensive clinical approach to NMTD.

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AOCN-0336
NCS/EMG workshop (Those registered for the Neuromuscular US workshop will have free access to this workshop also, However delegates must register to this workshop)

PRINCIPALS AND PITFALLS OF NERVE CONDUCTION STUDIES

J. Kimura[1]
[1], *USA*

AOCN 082016 KLM 06013

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The electrodiagnostic studies constitute an extension of the clinical history taking and physical examination rather than a separate laboratory test. Therefore, in order to take best advantage of the physiological assessment, we need to formulate a reasonable differential diagnosis based on their clinical examination. Nerve conduction studies and electromyography will help clinicians by: 1) confirming the clinical diagnosis; 2) characterizing the neuropathic process by documenting demyelination or axonal degeneration; 3) localizing the site of lesions, differentiating a focal versus diffuse process and 4) quantitating the abnormalities by the size of the elicited response, which approximately corresponds to the number of functional nerve and muscle fibers.

The registrant will: 1) appreciate the principles and pitfalls of various electrophysiologic approaches used to assess nerve conduction, 2) recognize the use of short incremental stimulation which covers a focal lesion in the evaluation of entrapment neuropathies, 3) learn the use of late responses such as F waves and H reflex and blink reflex for evaluating a diffuse neuropathic process and 4) identify typical features of neuropathy and learn how to document various pattern of abnormalities. During each workshop session, participants will observe various electrodiagnostic techniques currently in use for a neuromuscular disorder to understand the merit and demerit of commonly used methods, and technical pit falls which may lead to an erroneous interpretation of the acquired results. An ample time will be provided to facilitate discussions during the question and answer period at the end of each talk.

The course is designed for those interested in a broad review of electrodiagnostic medicine, especially to those dealing with patients with neuromuscular disorders, who may benefit from a referral for electromyography and nerve conduction studies as part of the clinical practice. It will also appeal to those wanting a current update on the subject and those interested in state-of-the art information and observation of electrophysiologic techniques. All these should lead to a better understanding of the use of electrodiagnostic studies in attending any patients with a neuromuscular disorder in the clinical practice of rehabilitation medicine.

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AOCN-0376
Neurorehabilitation (WFNR) Symposium: From Neuroscience to Clinical Practice

HI-TECH OR LOW-TECH IN NEUROREHABILITATION

L.S.W. Li[1]
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Recruitment of non-used brain cells to restore lost function is the basis of neuroplasticity after brain damage. There are various interventions developed in last one and half decades to enhance the process of neuroplasticity. Technology-dependent training such as use of robotic upper or lower limb trainers has been shown to be effective to enhance functional recovery. The pathophysiological basis for such an approach is task-specific and repetitive training. Other technologically related trainings to enhance neuroplasticity include virtual reality and neurostimulation. With advancement of technology, the virtual reality training can be of lower cost and conducted in the home environment. Neurostimulation can be delivered through peripheral or central stimulation, which can be either in the form of repetitive magnetic stimulation or transcutaneous direct current stimulation. Nevertheless, the behavioral training seems to be more effective through bottom-up approach even without the aids of advanced technology. Constrained-induced movement therapy was one of the first of such kind approach to enhance the function of paretic upper limb through repetitive training. Mental imagery and mirror therapy are other examples that were shown to be effective in enhancing upper limb function without the use of hi-tech. With such a large basket of new

interventions available in neurorehabilitation, the next clinical challenging question is on how to mix all these hi- and low- tech to provide optimal functional recovery in an individual patient.

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AOCN-0373
Neurorehabilitation (WFNR) Symposium: From Neuroscience to Clinical Practice

AUTONOMIC DYSFUNCTION IN SPINAL CORD INJURY

E.M. Hagen[1,2]
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[2]*University College London, Institute of Neurology, London, United Kingdom*

A spinal cord injury (SCI) above the sixth thoracic vertebra interrupts the supraspinal control of the sympathetic nervous system causing an imbalance between the sympathetic and the parasympathetic nervous system.

Patients with SCI have low resting blood pressure, orthostatic hypotension, episodes of autonomic dysreflexia, post-prandial hypotension, and poor heart rate response during exercise; exercise induced hypotension and arrhythmias which influence the rehabilitation and quality of life.

Autonomic dysreflexia (AD) is a sudden and severe rise in blood pressure, a potentially life-threatening condition which can occur in anyone with a SCI at or above thoracic level six (T6) both at any time after injury, triggered by stimuli below the injury. It may cause mild symptoms like skin rash or slight headache, but also severe hypertension, cerebral haemorrhage and death. Early recognition and prompt treatment are important

Patients with cervical and high thoracic SCI have a high risk of autonomic dysfunction and AD. Knowledge of autonomic dysfunction, especially AD is important for proper diagnosis and treatment.

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AOCN-0349
Neurorehabilitation (WFNR) Symposium: From Neuroscience to Clinical Practice

SPASTICITY IN STROKE

K.H. Kong[1]

[1]*Tan Tock Seng Hospital, Rehabilitation Medicine, Singapore, Singapore*

The prevalence of poststroke spasticity varies from 27% at 3 months to 34% at 18 months after stroke. Spasticity as defined by "a velocity-dependent increase in tonic stretch reflex" does not take into account other spasticity-associated phenomena which may have more clinical impact on the patient. These include co-contraction, synkinesis and spasms. Also important to note is that the increase in tonic stretch reflex is due to 2 components – a neural component and a mechanical component. In chronic spasticity, the latter is likely to be a more important contributor, and this has implications on treatment strategies. Generally speaking, spasticity should only be treated when it is symptomatic. A multidisciplinary team approach that focuses on the patient's goals is likely to give the best outcome.

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AOCN-0375
Plenary 2 -Translational Neuroscience Symposium

DYSTONIA: FROM BENCH TO BEDSIDE
R. Kaji[1]
[1]*Tokushima University, Neurology, Tokushima, Japan*

Dystonia : from bench to bedside
Ryuji Kaji MD, Phd

X-linked Dystonia-Parkinsonism (XDP) is an endemic disease in Asia, but the patients are seen in various parts of the world. I will review the recent advances in the genetics, clinical features and pathology. It also has important implications for other idiopathic dystonia in general.

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AOCN-0383
Dementia 1-The non-Alzheimer's dementia

THE REVERSIBLE DEMENTIAS – ARE THEY TRULY REVERSIBLE?
M. Tripathi[1]
[1]*, India*

Reversible Dementia

There are many potentially reversible causes of dementia, which may respond to specific interventions, if diagnosed in time. One out of five cases of dementia may have a condition, which may respond to definite treatment. Few potentially reversible causes of dementia are listed below. In a study of 1000 persons attending a memory disorder clinic, 19% had a potentially reversible cause of the cognitive impairment and 23% had a potentially reversible concomitant condition. The three most common potentially reversible diagnoses in this series were depression (pseudo-dementia), hydrocephalus and alcohol dependence. However new entities are emerging.

Causes of Reversible dementia:

1. Alcoholism
2. Drug/ medication intoxication
3. Vitamin deficiencies: B1, B6, B12
4. Endocrine disorders: Thyroid, Parathyroid, Adrenal hypo or hyperfunction
5. Organ failure: Liver, Kidney, Pulmonary
6. Chronic infections: Neurosyphilis; PMLE; Tuberculosis; Fungal; Protozoal
7. Chronic inflammation: Sarcoidosis, Coeliac disease, Whipple's disease
8. Surgical conditions: Subdural hematoma; Normal pressure hydrocephalus(NPH); Primary and metastatic brain tumors
9. Psychiatric disorders: Depression; Schizophrenia; Conversion disorder
10. Others: Vasculitis; Acute intermittent porphyria; Nonconvulsive status, autoimmnune, OSAs.

In this talk I will be discussing some important causes of potentially reversible dementia with few relevant case discussions.

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AOCN-0333
Dementia 1-The non-Alzheimer's dementia

A MULTICENTRE STUDY OF FRONTAL TEMPORAL DEMENTIA IN ASIA: A LESSON FROM OKAYAMA FTD STUDY

K. Abe[1]
[1]*Okayama University, Okayama, Japan*

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<A muticntre study of frontotemporal dementia comparing to Alzheimer's disease (oFTD Study)>

In order to compare comprehensive clinical evaluations of frontotemporal dementia (FTD)

patients with Alzheimer's disease (AD) patients, we used 8 clinical batteries and the touch panel test to retrospectively analyze 41 FTD patients compared with 121 AD patients. Furthermore, 34 FTD and all 121 AD patients were evaluated with a frontotemporal dementia-Alzheimer's disease index (FA index), which we developed for novel diagnosis with magnetic resonance imaging. Frontal assessment battery, geriatric depression scale, and Abe's behavioral and psychological symptom of dementia score (ABS) were significantly worse in FTD patients than in AD patients (**p< 0.01 in FAB, **p< 0.01 in the geriatric depression scale, and ***p< 0.001 in ABS), although there was no significant difference in the other five scores. The finding mistakes game score of the touch panel test was worse in FTD than in AD (*p< 0.05). The receiver operating characteristic curve of the FA index showed 91.4% sensitivity and 89.3% specificity with the FA index ≤0.6015 to discriminate FTD from AD. The present study suggested that combining clinical scores, a computerized touch panel test, and the FA index will help to provide a more accurate diagnosis of FTD in contrast to AD.

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AOCN-0326
Dementia 1-The non-Alzheimer's dementia

DOUBLE TROUBLE : CEREBROVASCULAR DISEASE WITH ALZHEIMER'S DISEASE

N. Kandiah[1]
[1]*National Neuroscience Institute, Neurology, Singapore, Singapore*

Double Trouble: Cerebrovascular Disease with Alzheimer's Disease

With the rapid increase in the prevalence of dementia worldwide there has been significant research into modifiable risk factors for dementia. In this regard cerebrovascular diseases (CVD) represent a potential therapeutic target in the fight against the epidemic of dementia. Both large vessel CVD and small vessel disease in the form of chronic lacunes, white matter hyperintensity, microbleeds, and perivascular spaces have been strongly associated with the risk of developing dementia. These CVD factors may initiate or accelerate the amyloid and tau cascades resulting in greater rates of neurodegeneration and dementia. Understanding the precise mechanisms for the interaction between CVD and neurodegeneration will allow development of potential interventional targets. These CVD risk factors may be of particular relevance to the Asian population where a high burden of small vessel CVD has been demonstrated in Asian patients with dementia. In this presentation, the clinical spectrum of the syndrome of Alzheimer's with CVD, the pathogenesis, neuroimaging features and interventional strategies will be discussed.

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AOCN-0400
Dementia 2- Assessment and treatment of Alzheimer disease and other dementias

TOWARDS PATIENT CENTRED CARE PRACTICES IN DEMENTIA CARE

T.C. Kwok[1]
[1]*The Chinese University of Hong Kong, Director of Jockey Club Centre for positive ageing, Hong Kong, Hong Kong- China*

Dementia is a chronic progressive condition without a cure. But there are great individual variations in the rate of functional decline. Physical exercise, social engagement, and a healthy diet are important protective factors. Fall, fractures and concomitant illnesses can potentially precipitate significant functional decline. The care of older people with dementia therefore has a very significant influence on the rate of functional decline. Yet care of people with dementia is particularly difficult and stressful. Training and counseling of family caregivers has been consistently shown to be effective in reducing caregiver burden and behavioral problems in people with dementia. In addition, day care, which includes social stimulating activities, is effective in reducing caregiver burden and slowing cognitive decline. It is almost inevitable that people with dementia will come the care of hospital or nursing home at some stage. It is very important to ensure good care of people with dementia in these settings. Otherwise they will become confused and immobile very quickly. Staff in hospital wards and nursing home should therefore be given specific training in dementia care, and quality assurance is in place to ensure quality service to these individuals. With optimal care, it is possible to maintain the quality of life of people with dementia care.

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AOCN-0337
Dementia 2- Assessment and treatment of Alzheimer disease and other dementias

NEUROPSYCHIATRIC SYMPTOMS OF DEMENTIA AND COGNITIVE DECLINE

S. Yusoff[1]
[1]*, Malaysia*

The neuropsychiatric symptoms of dementia or the *behavioral and psychological signs and symptoms in dementias* (BPSD) is defined as disorders of perception, thought content, mood, or behavior in dementia. It is a frequent non-cognitive symptoms of dementia. It can occur in up to 90% of patients with dementia, at least once through the duration of the illness. BPSD cause a great deal of suffering to the patient and to the people related with the patient as it can lead to an increase in the costs of care, premature nursing home placement, and to a significant loss of quality of life of the patient, family members, and caregivers. The presence of BPSD is associated with more psychopharmacological use and physical restriction. BPSD is known to be persistent, but it may change with time and new BPSD symptoms may emerge

as the earlier symptoms disappear. The relationship between the degree of cognitive impairment and BPSD is still controversial. According to Serra (2010), studies so far did not show any indication that the severity of BPSD in the early phases of AD is predictive of the rate of subsequent cognitive decline.

Although the key characteristics in both cognitive and behavioral symptomatology showed progressive neuronal deficit, diminished cholinergic function, and consequent diffuse cerebral atrophy but there are features which may suggest etiological independence between BPSD and cognition. These include the fact that firstly not all patients with dementia exhibit BPSD, and that the severity and duration of BPSD are relatively different for each subject. Secondly there is discrepancy between the occurrence of BPSD and linear decline in cognitive impairment. Thirdly, the hippocampus & amygdala are the main memory centres, but BPSD rely on circuits that may involve distal areas.

There are 3 main issues that I would like to bring up for discussion in this sessions. These include: looking into the symptoms of BPSD that are most correlated with cognitive impairment or decline. Is the onset of AD, early or late had any significant impact on BPSD and cognitive impairment/ decline and finally whether cognitive impairment improved with treatment of BPSD and vice versa.

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AOCN-0334
Dementia 2- Assessment and treatment of Alzheimer disease and other dementias

PREDICTORS OF CONVERSION FROM MCI TO ALZHEIMER'S DISEASE

K. Abe[1]
[1]*Okayama University, Okayama, Japan*

<Clinical predictors of mild cognitive impairment for converting to Alzheimer's disease and reverting to normal cognition>

In order too identify clinical and demographic predictors for mild cognitive impairment (MCI) conversion to Alzheimer's disease (AD) or reversion to normal cognition, and sustained MCI, we retrospectively investigated 74 baseline MCI subjects and categorized into 3 subgroups: conversion to AD, sustained MCI, or reversion to normal cognition during one year. The clinical and demographic characteristics assessed were age, gender, educational attainment, vascular risk factors, white matter lesions (WMLs), and parahippocampal gyrus atrophy (PGA), analyzed by magnetic resonance imaging (MRI) using the voxel-based specific regional analysis system for AD (VSRAD). Of the 74 MCI subjects, 29 (39.2%) were classified as "converters", 39 (52.7%) as "sustained MCI", and 6 (8.1%) as "reverters".

Among the three subgroups, there were significant differences in educational attainment (years) (*p = 0.03), baseline mini-mental state examination (MMSE) scores (***p<0.001), and periventricular and deep white matter hyperintensity grades (*p = 0.02 and *p = 0.03, respectively). Baseline PGA showed a significant increasing trend among the three subgroups (reverters<sustained MCI<converters, (###)p<0.001). MCI subjects with higher educational attainment and low VSRAD Z-scores without WMLs were associated with reversion to normal cognitive function. The present study suggested that risk factors for MCI conversion to AD were low educational attainment, low baseline MMSE scores, high grade WMLs, and high VSRAD Z-scores. High educational attainment, low VSRAD Z-scores, and no WMLs characterized reversion to normal cognition.

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AOCN-0399
Neuromuscular/Neurophysiology 1-Inflammatory Myopathy

SPORADIC INCLUSION BODY MYOSITIS IN ASIAN REGION

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Sporadic Inclusion Body Myositis (sIBM) is a late onset inflammatory and degenerative myopathy with characteristic clinical features of quadriceps and finger flexors weakness and atrophy, in association with endomysial inflammatory infiltrates, rimmed vacuoles and protein accumulation seen on muscle histopathology. Despite having prominent inflammatory infiltration and Major Histocompatibility Complex (MHC) Class 1 antigen expression on sarcolemma, the response to immunosuppression is poor.

sIBM is said to be the commonest type of inflammatory myopathy affecting persons 50 years of age or older in the Western population, but its prevalence in Asian region is not clearly known and appears to be relatively uncommon. This presentation will survey its prevalence in the Asian region and also review the clinical features, diagnostic criteria, pathophysiology and management of sIBM.

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AOCN-0345
Neuromuscular/Neurophysiology 1-Inflammatory Myopathy

UPDATES ON DERMATOMYOSITIS

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In the European Neuromuscular Centre (ENMC) classification criteria, definite dermatomyositis (DM) is defined based on muscle pathology features of perifascicular atrophy together with the typical skin lesions and muscle weakness. In its absence, any one of perivascular inflammation, perifascicular MHC-1 positivity, complement activation and deposition in vessels or raised creatine kinase suggests only probable DM. In DM, the autoimmune process is targets the blood vessels, activating complement and resulting in muscle ischaemia. In addition, upregulation of Type 1 interferon inducible genes and proteins e.g. myxovirus resistance protein A (MxA) have been shown in a perifascicular pattern in muscle and may contribute to DM pathogenesis. Specific autoantibodies correlate with certain DM phenotypes: anti-Mi2 with characteristic skin lesions and mild disease, anti-MDA5 with amyopathic DM and interstitial lung disease, anti-TIF1γ with increased risk of malignancy and anti-NXP with severe juvenile DM.

DM typically represents about a third of patients with idiopathic inflammatory myopathy (IIM), is more common in women and occur both in children and adults. In adults, DM is associated with malignancy at frequencies ranging from 6 to 45%. In our hospital cohort of 389 patients with IIM, DM based on histopathological confirmation was found in 131 (33.9%) of which 64 (49%) were juvenile DM.

There are few randomised controlled studies on the treatment of DM. Therapy usually consists of corticosteroids initially followed by other immunosuppressive agents e.g. methothrexate and azathioprine. Intravenous immunoglobulin (IVIG) can be considered in severe or non-responsive patients. Rituximab may be useful in refractory myositis although a recent large trial was negative.

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AOCN-0355
Neuromuscular/Neurophysiology 2-Inherited Neuropathies

CMT AND OTHER INHERITED NEUROPATHIES: CLINICAL PERSPECTIVE
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CMT and other inherited neuropathies: a clinical perspective

Garth Nicholson, Gonzalo Perez-Siles, Monique Ryan, David Chuang, Marina Kennerson

The inherited neuropathies are a group of disorders caused by mutations in over 80 different genes. The commonest clinical forms are motor and sensory neuropathies (Charcot-Marie-

Tooth, CMT neuropathy). Inherited sensory neuropathies are rare but motor neuropathies are not uncommon and can have upper as well as lower motor neurone signs, these disorders can overlap with the spastic paraplegias. Once the common CMT1A duplication/deletion has been excluded, only about 50% of the remaining families have identifiable mutations in known neuropathy genes. In families without detectable neuropathy gene point mutations the disease is presumably caused by non coding DNA alterations that may result in dysregulation of genes that are essential for peripheral nerve function.

Demyelinating CMTs have a very recognisable phenotype with childhood onset, pes cavus, slow nerve conduction velocities and absent sensory action potentials. CMT1A can be confirmed by detection of the CMT1A duplication. Axonal CMTs have varied phenotypes and many different gene mutations.

Nerves are sensitive to gene dosage. Gene overdosage (as in CMT1A) and other dysregulation mechanisms offer attractive targets for the development of gene therapies. Some neuropathy gene point mutations are in enzymes that may offer targets for developing treatments, eg competitive substrate inhibition in serine palmitoyl transferase for hereditary sensory neuropathy (HSN1) and pyruvate dehydrogenase kinase inhibition in CMTX6. It is now time to develop appropriate outcome measures for future treatment trials. Because most inherited neuropathies involve length dependent distal axonal degeneration, the level of active degeneration is a slow proximally moving target. Special outcome measures will be needed for inherited neuropathy therapeutic trials in order to avoid floor and ceiling effects so that progress of the disease can be measured in time and space.

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AOCN-0346
Neuromuscular/Neurophysiology 2-Inherited Neuropathies

GENOMICS IN INHERITED NEUROPATHIES

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What is next generation sequencing telling us about inherited neuropathies?

Inherited peripheral neuropathies (IPNs) are a group of diseases causing length-dependent axonal degeneration in the motor and/or sensory neurons resulting in long term disability. IPNs are genetically heterogeneous with over 1000 mutations in more than 80 genes reported. Next generation sequencing (NGS) has had major impacts on IPN diagnosis and gene discovery. Our research is highlighting the spectrum of DNA mutations causing IPNs from point mutations in genes to structural variation (SV) mutations involving thousands to millions of base pairs.

To harness the power of NGS technology we validated whole exome sequencing (WES) as a diagnostic tool in 110 index patients pre-screened for the CMT1A duplication, *MPZ, GJB1, MFN2* and identified reported and novel mutations in known genes in 18.2% of cases. Our study highlighted the advantage of WES for IPN testing when inheritance was unclear however first tier testing for common genes in clinically well-defined cases remains important and will account for most positive cases.

NGS has facilitated gene discovery and the recent identification of *MORC2* gene mutations as a cause of axonal CMT again highlights the genetic heterogeneity of IPNs. In our cohort of 110 index families we identified a *MORC2* mutation (R252W/R190W) in a CMT2 family with pyramidal signs. Importantly, this family mapped the disease locus harbouring the *MORC2* gene to chromosome 22q12.1-q12.3 thereby demonstrating the use of family linkage studies combined with NGS technologies remains a powerful approach to validate gene discoveries.

For the unsolved families in our IPN cohort, a proportion have no detectable protein-coding mutation after WES in multiple family members. This is being recognised as an increasing diagnostic problem for IPNs. It is likely the mutations in these unsolved families are due to mutations (SNV/indels) in non-coding DNA or structural variation (SV) mutations. Using whole genome sequencing we have identified large novel chromosomal DNA insertions in families that cause two different inherited peripheral neuropathies: X-linked Charcot-Marie-Tooth neuropathy (CMTX3) and distal hereditary motor neuropathy (DHMN1). This finding represents novel genetic mechanisms for IPNs and highlights the growing importance of interrogating the non-coding genome for SV mutations in families which have been excluded for genome wide coding mutations.

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AOCN-0328
Plenary 3- Autoimmune Neurological Disorders

GUILLAIN-BARRE SYNDROME IN ASIA

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Guillain-Barré syndrome (GBS) is currently classified into the two major categories; acute inflammatory demyelinating polyneuropathy (AIDP; a classical demyelinarig form) and acute motor axonal neuropathy (AMAN; an axonal variant). AMAN is a pure motor axonal subtype that was identified in the late 1990s. In Asia and Central/South America, it is the major subtype of GBS, seen in up to 50% in China, and approximately 50% in Japan.. It is now established that AMAN is caused by molecular mimicry of human gangliosides by *Campylobacter jejuni* lipo-oligosaccharides. In addition to axonal degeneration, electrophysiology shows rapidly reversible nerve conduction block or slowing, due to pathological changes at the nodes or paranodes, termed as “nodopathy”. Autoantibodies that bind to GM1 or GD1a gangliosides at the nodes activate complement and disrupt sodium-

channel clusters and axoglial junctions, which leads to nerve conduction failure and muscle weakness. Complement inhibition is a new treatment option, and clinical trials are ongoing.

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AOCN-0316
Plenary 3- Autoimmune Neurological Disorders

AUTOIMMUNE LIMBIC ENCEPHALITIS-CURRENT PRACTICE AND CHALLENGES IN ASIA

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Autoimmune limbic encephalitis-current practice and challenges in Asia

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Limbic encephalitis refers to non-viral inflammation, mainly involving the limbic system, including the mediotemporal lobes, amygdala, and cingulate gyrus. It is defined by clinical symptoms, such as retrograde amnesia, temporal lobe seizures, or psychiatric symptoms, and by radiological evidence, such as nonatrophic hyperintensity of the mediotemporal lobes at early course, or by detection of antibodies associated with limbic encephalitis.

Non-viral Limbic encephalitis, which may be paraneoplastic or idiopathic, is increasingly recognized in adults and children. Early identification of potential patients who have neuronal autoantibodies to intracellular or neuronal surface antigens in order to give appropriate immunotherapy is keys to improving the prognosis. We enrolled children and adolescents who had been hospitalized due to non-viral limbic encephalitis. Serum samples from these patients were collected to screen antibodies against intracellular antigens (amphiphysin, Ma2, Ri, Yo, Hu and anti-glutamic acid decarboxylase [GAD]) and neuronal surface antigens (N-methyl-D-aspartate [NMDA] receptor, γ-amino butyric acid [GABAB] receptor, voltage-gated potassium channel complexes [VGKCs]). All of the 10 enrolled patients had acute onset of fever and rapid clinical deterioration. All of them had persistent neuropsychiatric symptoms and 90% developed refractory epilepsy despite 6 patients having been treated with methylprednisolone pulse therapy or intravenous immunoglobulin (IVIG) at the acute stage. In the laboratory findings, half of the cases were positive for antibodies with regards to intracellular antigens (amphiphysin or GAD). The general outcomes, assessed by Glasgow Outcome Scale, were similar between patients with and those without the antibodies (Mann-Whitney U test, $p = 0.43$). One patient who was positive for antibodies to amphiphysin 10

years after disease onset still had significant response to oral prednisolone therapy. At the end of the follow-up period, no cancer or insulin-dependent diabetes mellitus was detected in any of the patients.

There is evidence for potential association between antineuronal antibodies and limbic encephalitis. The presence of antineuronal antibodies, especially antibodies to GAD, may serve as an indicator for immunotherapy.

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AOCN-0392
Teach In Session 2- Approach to cerebellar examination (with emphasis on bedside clinical examination), and quantitative assessment

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Patients of cerebellar disorders present mainly with motor ataxia or incoordination and reduced muscle tonus, which include unstable, ataxic gait, incoordination of upper and lower limbs, slurred and scanning speech, nystagmus and hypotonia. These signs' grades are evaluated subjectively by trained neurologists and may be scored with ICARS and SARA score, which appears hard to detect a subtle change due to slow progression found in neurodegenerative diseases.

In order to develop a system quantitatively evaluating cerebellar functions, we paid attention to the motor learning among various cerebellar functions such as equilibrium, coordination and cognition. There has been a long history of researches on cerebellar motor learning in neurophysiology field of medical sciences. We thought prism adaptation using finger reach movement may be a good candidate task because adaptation time is fairly short in the task. The examinee wearing prism-equipped goggles touches their index finger to the target on a touchscreen in every trial. The whole test was composed of 3 consecutive sessions: 1) 50 trials with normal vision (BASELINE), 2) 100 trials with a prism shifting the visual field 25°rightward (PRISM) and 3) 50 trials without the prism (REMOVAL). In normal control, touched points deviated greatly with a prism but gradually returned to the correct target during repeated trials. The touched points deviated similarly to the opposite direction when the prism was removed and returned again to the correct target after repeated trials. Adaptation index (AI) was calculated by multiplying each probability of acquisition in the last 10 trials of PRISM, retention in the initial 5 trials of REMOVAL and extinction of in the last 10 trials of REMOVAL. AI was beautifully distinguished patients with cerebellar ataxia from normal controls and significantly correlated with SARA and 9HPT scores. In addition, AI of aged controls was significantly lower than that of young controls suggesting age-dependent decrease of motor learning function of the cerebellum. This system is compact and easy to use at outpatient clinics and useful to quantitatively evaluate the cerebellar function in clinical trials for cerebellar disorders.