NEU-S01

Point-of-care Ultrasound in Neurocritical Illness

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Point-of-care ultrasound is an array of specific examinations aim to answer tailored clinical questions. Improved image quality, easily accessible machine, inexpensive, and more versatile ultrasound equipment has held the ultrasound probe firmly in the hand of the intensivist. Critical care provider integrating bedside ultrasound into clinical decision-making benefits critical illness patients by improving diagnostic accuracy. The goal of this talk is to present the most striking techniques and concepts in point-of-care ultrasound to clinicians working in the neurology intensive care units. We will introduce the basic direction in indications for given ultrasound examination and high-quality images acquisition. The various medical problems in neurocritical patients would be exhibited frequently. The timely investigation of cardiac comorbidities and pulmonary problems is crucial. Evaluation of hemodynamic status is helpful to optimize the cerebral perfusion pressure. Furthermore, the advanced practice providers (APPs) who are trained and educated similarly to physicians are a growing part of the critical care team and play an important role in the care of patients admitted to ICU. Several studies support the quality care provided by APPs who are dedicated to perform POCUS is imperative to meet the standards of care in these settings. APPs continue to allow for real-time evaluation in focused way. Except for procedural guidance, POCUS is being indispensable a powerful tool for screening, diagnosis, and monitoring.

NEU-S02

Transcranial Doppler Ultrasound in Neurocritical Care

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In the field of neurologic intensive care, it is important to monitor the hemodynamic of brain. It not only helping to adjust treatment strategy but also providing neurologic prognosis. Although brain imaging technology is progressing, ultrasound is still irreplaceable due to its low cost, non-invasion and convenience. Through the parameter of transcranial Doppler (TCD) such as flow velocity and pulsatility index, we could evaluate real-time brain circulation, vessel stenosis and even intracranial pressure. In this section, I will introduce how to use TCD to detect vasospasm in subarachnoid hemorrhage and IICP in neurocritical illness.

NEU-S03

Changes of Bilateral Intracranial Arteries after Unilateral Indirect Revascularization Surgeries in Patients with Moyamoya Disease

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Research purpose: The cerebral hypoperfusion of Moyamoya disease (MMD) can be treated by indirect revascularization surgeries. The post-operative changes of ipsilateral superficial temporal artery (STA) are correlated with collateral grades on angiography. It remains elusive about the influence of unilateral surgeries on bilateral intracranial arteries in MMD patients.

Materials and methods: MMD Patients who would undergo unilateral indirect revascularization surgeries with non-operated contralateral side were included. The pre- and post-operative

ultrasonographic exams were analyzed, dividing the patients into three groups according to the hemodynamic changes of middle cerebral artery (MCA) or anterior cerebral artery (ACA): (group-1) no flow before and after operation, (group-2) pre-operative no flow turned into post-operative detected flow, and (group-3) detected flow before and after operation.

Results: A total of 53 patients (24 pediatric, 24 male) were enrolled. Nineteen patients (36%) had no flow in the ipsilateral MCA or ACA before operation. All parameters (peak-systolic velocity [PSV], end-diastolic velocity [EDV], resistance index [RI], and flow volume [FV]) of the ipsilateral STA and ECA were significantly different between pre- and post-operative exams. The post-operative PSV, EDV and FV of ipsilateral STA were higher and the RI was lower in the group-1 compared with group-2 for the ipsilateral ACA, contralateral ACA and MCA. In contrast, the ipsilateral MCA had a revered pattern, that were lower PSV, EDV, and FV in the group-1 compared with group-2. The post-operative maximal and mean velocities of contralateral MCA were significantly correlated with PSV of ipsilateral STA, and those of contralateral ACA were correlated with RI and FV of ipsilateral STA. Furthermore, the significant determinant for post-operative flow emergence in the ipsilateral ACA were FV of ipsilateral STA, while that in the ipsilateral MCA were PSV and EDV of ipsilateral STA.

Conclusions: This study showed hemodynamic changes not only in the ipsilateral but also in the contralateral intracranial arteries after unilateral indirect revascularization surgeries in MMD patients.

NEU-S04

Correlation and Application of Cerebral Autoregulationand Perfusion in Acute Ischemic Stroke

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Cerebral hemodynamics is an important predictor of the outcome of acute ischemic stroke. In acute ischemic stroke (AIS), alterations of cerebral hemodynamics are commonly observed: Compensatory cerebral vasodilatation and increased cerebral blood volume (CBV) will occur under the mechanism of cerebral autoregulation, and therefore cerebral blood flow (CBF) can maintain stable. In patients with impaired cerebral autoregulation, there will be little compensatory cerebral vasodilatation or constriction, therefore the cerebral tissue is vulnerable to unstable perfusion pressure, which will result in high incidence of secondary ischemia in hypotension or hemorrhagic transformation in hypertension. CBF, CBV, and perfusion time can be quantified by perfusion imaging. Cerebral autoregulation is the mechanism to maintain a stable CBF under the changes of perfusion pressure, it can be quantified by using transcranial Doppler and peripheral blood pressure monitor with analytic software. In clinical practice, the perfusion imaging is applied for selecting endovascular thrombectomy (EVT) eligible patients, whereas the value of cerebral autoregulation is still under investigation. In this lecture, we will review the role of perfusion imaging and cerebral autoregulation in the treatment of stroke, and we will discuss the association between perfusion imaging and cerebral autoregulation.

NEU-S05

Shall We Screen "Intracranial Stenosis" in Head and Neck Cancer Patients after Radiation Therapy? – A Neurosonography-MR Cross Sectional Study

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Head and neck cancer (HNC) is a group of

cancers develop from the soft tissues, thyroid or salivary gland, mucosa of the upper respiratory or digestive system covering the oral and nasal cavity. The standard treatment of HNC is radiotherapy (RT). Among survivors of the HNC, late effects on "bystander" organs have become increasingly prevalent. The introduction of Photon-beam therapy for the treatment of HNC in the past two decades has been revolutionary. The application of Proton-beam therapy in the treatment HNC has been growing in the past few years. The physical properties of the Bragg peak allow for precise dose delivery, and localization of the Bragg peak to the tumor target brings minimal to no exit dose affecting normal tissues located beyond the specified depth. However, prospective data remain insufficient to confirm the improvement in neurological sequelae of chemoradiation, particularly in locally advanced and recurrent cases.

Of the long-term consequences of radiation injury, radiation vasculopathy with accelerated atherosclerosis, increased risks of carotid artery stenosis (CAS) have been reported before. Regarding the intracranial vessels, it is possible that the petrous bone may protect the intracranial vessels from radiation injury. However, intracranial stenosis has been rarely discussed before.

We hope to discuss the frequency of intracranial stenosis between different types of HNC and different types of radiation therapy. We will also discuss the other associated complication, such as temporal lobe necrosis, and ICA blow-out syndrome in these patients.

NEU-S06

脈壓與各項健康指標的關聯性 (Associations between Pulse Pressure and Health Metrics)

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脈壓 (PP) 是指收縮壓和舒張壓之間的差距，測量脈壓可用以評估動脈硬化的程度及心血管疾病的進展。由於血管老化，脈壓數值逐漸增加，而各年齡和不同性別的理想脈壓值還未明確。我們進行健康族群的前瞻性數據分析，以提出理想的脈壓值，並證明脈壓與各項健康指標的關聯性。1996 至 2016 年期間共招募了 162,636 名參與者 (年齡 20 歲以上；平均年齡 34.9 歲；26.4%男性) 符合良好的健康標準及心血管風險指標。男性的平均脈壓為 45.59±9.43 mmHg 在 50 歲後增加；女性的平均脈壓為 41.83±9.47 mmHg 在 40 歲後增加。其中，女性的平均脈壓自 50 歲起 (45.05±9.90) 超過男性的平均脈壓 (43.27±8.86)。我們也證明了平均脈壓介於均值 ±1SD 之間的參與者較可能達到健康指標，包括身體質重指數 (BMI) <25 (男性的卡方=9.35，p<0.01；女性的卡方=208.79，p<0.001)，和血壓 (BP) <120/80mmHg (男性的卡方=1300，p<0.001；女性的卡方=11000， p<0.001)。根據五項指標(BP、BMI、運動量、吸煙、和健康飲食)的總和，我們進一步提出健康分數，並證明健康分數與理想脈壓值之間顯著相關。

NEU-S07

Artificial Intelligence for the Report of Neurovascular Ultrasound Examination

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This research is a retrospective study of medical records, which uses artificial intelligence (AI) to generate examination report of neurovascular ultrasound examination automatically, and evaluate the consistency of the automatic generated report and the physician's interpretation. The neurovascular ultrasound examination data from June 1 to June 30, 2020 are collected intentionally, and the consistency of the doctor's interpretation and the AI system's automatic report are examined. The degree of consistency between the two, and the doctor's mental map when interpreting the results are explored using the confusion matrix and tree analysis chart. The results showed that different measurements of neurovascular ultrasound have reached statistically significant agreement between

physicians and the AI system. The results also showed that 4 out of 100 extracranial and 1 out of 100 intracranial vascular ultrasound reports are wrong due to humans factors. At present, the automatic report generation system only performs interpretation and analysis based on numeric data, while the report interpreted by the physician combines both numeric data and images. It is roughly estimated from the research results that at least about 1.5% of the reports may not be able to rely solely on numeric data and provide correct interpretations. The automatic report generation system evaluated in this research, which is used to interpret the data of neurovascular ultrasound examination, has good consistency with the results of the report interpreted by physicians. In addition, this study also found that there are human errors in reports interpreted by physicians. It is expected that the clinical decision support system will allow physicians to quickly obtain auxiliary information, reduce the occurrence of human errors and work time, and improve the accuracy and timeliness of the report.

NEU-P01

Sonographic Characteristics in a Case of Tissue-proof Temporal Arteritis

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Background: This is a case report of temporal arteritis.

Results: A 78-year-old lady presented with two weeks of non-pulsatile severe headache over right temporal area (numeral rating scale of pain [NRS] 10/10). There were associated symptoms including visual changes (visual torsion like looking through heat waves), photophobia and poor appetite. There was no phonophobia and nausea/vomiting. She had no vascular risk factors but a past history of sudden left ear deafness in 2016. On admission, her blood pressure, heart rate and body temperatures were normal. However, a tortuous temporal artery on her right side was noted (Figure 1). The neurological examinations did not show any focal neurological deficit. Her blood examinations revealed WBC: 8000/cubic mm with differential count segmented neutrophil 89.1% and lymphocyte 6.3%, Hgb: 11.8g/dL, Platelet: 344X103 cubic mm and a significantly elevated erythrocyte sedimentation rate (ESR): 83 mm/hr. She was then received color-coded ultrasonography and the result showed typical hypoechoic wall thickening (halo sign) in right temporal artery (Figure 2). Under the tentative diagnosis of temporal arteritis, a biopsy of right temporal artery was performed. The pathological findings confirmed the diagnosis: neointima hyperplasia and significant immune cell infiltration including lymphocytes and giant cells in the media (Figure3). Patient was prescribed methylprednisolone i.v. 1000 mg for five days and her headache and associated symptoms were subsided on the third day of pulse therapy.

Conclusion: Temporal arteritis is a rare disease and mostly responsive to prednisolone therapy. In clinical-suspected cases, color-coded ultrasonography is a useful tool for early diagnosis.

NEU-P02

A Retrospective Study of Outpatients with Carotid Artery Stenosis Using Carotid Artery Ultrasound Imaging Analysis

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Objective: This retrospective study aimed to investigate the correlation between internal carotid artery (ICA) stenosis levels and their vascular sonography parameters of outpatients with ICA

stenosis, as the stroke early detection markers.

Methods: ICA stenosis levels were separated into 0%, 0-20%, 20-40%, 40-60%, and >60% of outpatient groups were determined via carotid ultrasound image analysis in 5046 patients with different diagnosis at the Taipei Branch of the Chinese Medical University Hospital from Aug. 2010 to Nov.2019.

Results: Both right and left sites of PSVICA (cm/sec) and PSVECA (cm/sec) were significant increased with ICA stenosis levels (***p < 0.001), whereas PSVCCA (cm/sec) was significantly reduced with the levels of ICA stenosis (***p < 0.001). The EDV (cm/sec) values of CCA, ICA, ECA, and VA were all significantly reduced with the levels of ICA stenosis (***p < 0.001), compared to healthy controls. Moreover, resistance index (RI) were significant increased with ICA stenosis levels (**p < 0.01). In addition, PSV (cm/sec) of ICA to CCA ratios were all < 2 (0.75~1.29) in the five stenosis groups, while PSVICA values in the five stenosis groups were all < 125 cm/sec (65.57~105.07 cm/sec).

Conclusion: ICA stenosis levels may be a potential biomarker for diagnosis of patients with stroke. However, in our ICA stenosis groups (even > 60%) were all belong to moderate level of stenosis. Additionally, there are some risk factors in our outpatients including age > 40 years, male > female, diseases (e.g., hyperlipidemia, DM, HTN), and life styles (e.g., smoking and drinking).

Key words: Carotid Artery Ultrasound, Stroke, Internal Carotid Artery (ICA) Stenosis, Retrospective Analysis