The 32nd Annual Meeting of the Japan Academy of Neurosonology
June 14-15, 2013, Tokushima, Tokushima

ABSTRACT

THE JAPAN ACADEMY OF NEUROSONOLOGY

第32回日本脳神経超音波学会
英文抄録集

平成25年6月14日（金）〜15日（土）
徳島県徳島市 あわざんホール
会長：高瀬憲作（徳島県立中央病院 脳神経外科 部長）
Symposium 1
Neurosonology in management of atrial fibrillation, and cerebral embolism

S-1-2
Three-dimensional analysis of the left atrial appendage for detecting paroxysmal atrial fibrillation in acute stroke patients
Koji Tanaka¹, Masatoshi Koga², Kazuaki Sato¹, Rieko Suzuki¹, Kazuo Minematsu¹, Kazunori Toyoda¹
¹Department of Cerebrovascular Medicine, ²Division of Stroke Care Unit, National Cerebral and Cardiovascular Center, Japan

Purpose: This study aimed to evaluate the association between volume of the left atrial appendage (LAA) measured by real-time three-dimensional transesophageal echocardiography (RT 3D-TEE) and presence of paroxysmal atrial fibrillation (PAF) in acute stroke or transient ischemic attack (TIA).

Methods: RT 3D-TEE was performed to measure LAA volume twice before and after ECG-p wave (LAA end-diastolic volume and end-systolic volume; LAA-EDV and LAA-ESV) to calculate ejection fraction of LAA (LAA-EF). Patients with normal sinus rhythm (NSR) at the examination were selected.

Results: Of a total of 146 patients, 102 (29 women, 72.2 ± 10.7 years) had NSR at the examination. In 23 patients with PAF, both LAA-EDV (37.3 ± 19.1% vs. 57.1 ± 17.5%, p <0.001) and LAA-ESV (37.3 ± 19.1% vs. 57.1 ± 17.5%, p <0.001) were smaller and LAA-EF (37.3 ± 19.1% vs. 57.1 ± 17.5%, p <0.001) was lower than remaining 79 patients without PAF. The optimal cutoffs of LAA peak flow velocity, LAA-EDV, LAA-ESV, and LAA-EF to predict PAF were ≤39.0cm/s (sensitivity, 54.6%; specificity, 89.7%; and c-statistic, 0.762), >7.50ml (sensitivity, 47.8%; specificity, 83.5%; and c-statistic, 0.699), >1.85ml (sensitivity, 95.7%; specificity, 56.9%; and c-statistic, 0.799), and ≤47.9% (sensitivity, 78.3%; specificity, 74.7%; and c-statistic, 0.774).

Conclusions: LAA volumetric analyses by RT 3D-TEE are useful for detecting PAF in acute stroke or TIA.

Keywords: real-time three-dimensional transesophageal echocardiography, left atrial appendage, paroxysmal atrial fibrillation

S-1-3
Signal Characteristics of Micro embolic Signals(MES) by Transcranial Doppler Sonography in Patients with Cerebral Embolism
Hideki Ohba, Masato Kin, Hirotaka Oikawa, Kazumasa Ohura, Yasuo Terayama
Department of Neurology and Gerontology, Iwate Medical University School of Medicine, Japan

Purpose: We analyzed the signal characteristics of microembolic signals (MES) with transcranial Doppler (TCD) ultrasonography and investigated their usefulness for such differentiation in cerebral embolism patients.

Subjects comprised cerebral embolism patients within one week of onset as follows: 22 cardiogenic embolism patients and 28 patients with atherothrombosis due to main artery stenosis.

Methods: The TCD system used was Multi-Dop X4 (DWL, Germany). Blood flow waveforms of the middle cerebral artery were measured for 20 min on the affected side with a 2 MHz probe. MES signals were those confirmed to have a chirping harmonic sound at a signal intensity of 6 dB or more above the background blood flow signal intensity. The items assessed as MES signal characteristics consisted of velocity, signal intensity, duration, and frequency.

Results: The MES detection rate was 23% with cardiogenic embolism and 71% with main artery stenosis. The MES velocity, signal intensity, duration, and frequency were all significantly larger with cardiogenic embolism than with main artery stenosis (p<0.05).

Discussion: Assessment of MES signal characteristics may be useful in determining the origin of emboli.

Keywords: Transcranial Doppler Sonography(TCD), Microembolic signals(MES), Cardioembolism
Dissolution of the left atrial appendage thrombus in patients treated with rivaroxaban

Junji Takasugi1, Hiroshi Yamagami1, Kaoru Obata1, Kozue Saito1, Takuya Okata2, Kazunori Toyoda2, Kazuyuki Nagatsu1

1Division of Neurology and 2Cerebrovascular Medicine, Department of Stroke and Cerebrovascular Diseases, National Cerebral and Cardiovascular Center, Suita, Japan

We report on the dissolution of left atrial appendage thrombus in 3 patients with nonvalvular atrial fibrillation (AF)-related stroke receiving low dose (10mg/day) rivaroxaban. Case 1. An 81-year-old woman presented to our hospital with left hemiparesis. Intravenous unfractionated heparin (UFH) was administered and was switched to rivaroxaban on day 3. TEE demonstrated the LAA thrombus on day 4. This was reduced in size on day 23, and disappeared on day 35. Case 2. A 75-year-old man presented to our hospital with left arm weakness. Brain MRI revealed acute infarcts in the bilateral cerebral hemispheres, and he was given intravenous UFH. TEE revealed LAA thrombus and rivaroxaban was started on day 3. Follow-up TEE showed disappearance of the thrombus on day 10. Case 3. A 75-year-old man presented to our hospital with aphasia and right hemiparesis. Brain MRI revealed acute infarction in the left MCA territory and ECG monitoring detected paroxysmal AF. He initially received intravenous UFH, and was switched to rivaroxaban on day 12. TEE detected the LAA thrombus on day 13, which resolved by day 19. In our cases, TEE showed disappearance of thrombi after 1 – 5 weeks of rivaroxaban treatment without recurrent stroke.

Keywords: Thrombus, Rivaroxaban, Ischemic stroke

Emergency carotid endarterectomy in acute ischemic stroke caused by mobile plaque of internal carotid artery after systemic thrombolysis – case report

Masayuki Sasaki1, Ayumi Arai2, Keiko Bono1, Mikihiro Yamazaki1, Kenichi Sakuta1, Renpei Sengoku1, Hitotaka Mitsumura1, Yu Kono1, Tsutomu Kaminayama1, Yasuyuki Iguchi1

1Department of Neurology, The Jikei University School of Medicine, Tokyo, Japan, 2Department of Radiology, The Jikei University Hospital

The patient was 60-year-old man with transient ischemic attack three times before. Mild stenosis of right internal carotid artery (ICA) was found by carotid ultrasonography and CT angiography. He had transient ischemic attack again on December 20XX, and then he was admitted in our hospital. Because mobile plaque was seen in right ICA by carotid ultrasonography, we planned carotid endarterectomy (CEA) in spite of mild stenosis.

He had suddenly left hemiparesis on the day 9 (NIHSS: 3 points). Right cerebral cortex infarction revealed by MRI. He was treated with rt-PA intravenously at 120 minutes after onset. After rt-PA administration, left hemiparesis improved dramatically. Because mobile plaque of ICA was high risk for ischemic stroke with the refractory to best medical treatment, we performed CEA two days after rt-PA therapy. He was discharged on the day 14 with no symptoms.

Emergency CEA should be considered for patients with mobile plaque that was high risk for artery to artery embolism, even if it was immediately after rt-PA therapy.

Keywords: mobile plaque, rt-PA, carotid endarterectomy

Carotid ultrasonography helps to avoid intravenous t-PA therapy in a patient with ischemic stroke due to acute aortic dissection

Yuka Kuronuma1, Masatoshi Koga2, Keisuke Tokunaga1, Hotake Takizawa1, Kotaro Miyashita1, Yutaka Iba1, Kazunori Toyoda1

1Division of Cerebrovascular Medicine, 2Division of Stroke Care Unit, 3Department of Neurology, 4Department of Cardiovascular Surgery, National Cerebral and Cardiovascular Center, Osaka, Japan

A 52-year-old man who suddenly fell down was transferred to our hospital 85 minutes after onset. On admission, blood pressure was 135/110 mmHg in the right arm and 116/77 mmHg in the left arm. He had mild consciousness disturbance, right unilateral spatial neglect, right homonymous hemianopia and mild right hemiparesis (NIHSS 5). Diffusion weighted magnetic resonance imaging of the brain revealed hyperintensities indicating early ischemic change in the left parieto-occipital lobe and the right ICA was poorly depicted on magnetic resonance angiography. Because there seemed to be no contraindications for intravenous (IV) tissue-type plasminogen activator (t-PA)
therapy, we decided to treat with IV t-PA and filled a syringe with dissolved alteplase along with the routine ultrasonography of carotid arteries. The ultrasonography revealed the right common carotid artery (CCA) occlusion and intimal flap/double lumen of left CCA and this finding let us stop the initiation of IV t-PA therapy. Urgent contrast-enhanced CT confirmed Stanford type A aortic dissection. The patient urgently had a total aortic arch replacement 293 minutes after stroke onset. He discharged home without any neurological deficit on day 26. We re-realized the role of carotid ultrasonography to rule out patients with acute ischemic stroke due to aortic dissection before IV t-PA therapy.

**Keywords:** acute ischemic stroke, carotid ultrasonography, intravenous t-PA therapy, aortic dissection

---

**S-2-5**

**Prediction of residual vascular occlusion by duplex carotid ultrasonography using end-diastolic ratio (ED ratio) before thrombolytic therapy**

Atsushi Tsuruoka, Takahiro Shimizu, Naoshi Sasaki, Yasuhiro Hasegawa
Department of Neurology, St. Marianna University School of Medicine, Japan

**Background and Purpose:** Endovascular therapy may be used after the administration of intravenous tissue plasminogen activator (IV-tPA) for patients with residual occlusion, however, recent randomized study failed to demonstrate the effects of such an intervention. Early selection of subgroup of patients indicative of endovascular therapy may be crucial for the successful intervention. We aimed to investigate whether end-diastolic ratio (ED ratio) before thrombolytic therapy is predictive of residual vascular occlusion after t-PA administration.

**Subjects and Methods:** A total of 36 consecutive patients treated with IV-tPA therapy, mean age of 72.8 ± 12.0 years old, were examined. Patients with brain ischemia in the posterior circulation were excluded. Plain CT scanning and duplex carotid ultrasoundography were performed in all patients before administration of tPA and ED ratio was calculated. Then we performed 3D-CT angiography or MR angiography to demonstrate residual occlusion in the major cerebral arteries and correlated with the ED ratio at admission.

**Results:** ROC analysis demonstrated area under the curve (AUC) for predicting residual occlusion was 0.717, and sensitivity and specificity were 50% and 68.7%, respectively for the cut off value of 1.4. When we adopt 1.98 for the cut off value of the ED ratio, sensitivity and specificity for the correct diagnosis were calculated as 28.6% and 100%, respectively.

**Conclusions:** The ED ratio measured by duplex carotid ultrasonography before thrombolysis therapy may be used to select the subgroup of patients with an indication of subsequent endovascular therapy with moderate accuracy.

**Keywords:** ED ratio, recombinant tissue plasminogen activator, neuroendovascular therapy

---

**S-2-6**

**Recanalization rate and clinical outcomes following intravenous rt-PA therapy in acute ischemic stroke**

Rieko Suzuki, Masatoshi Koga, Koji Tanaka, Yuki Sakamoto, Keisuke Tokunaga, Satoshi Yamamoto, Kazunori Toyoda, Kazuo Minematsu

1Department of Cerebrovascular Medicine, 2Division of Stroke Care Unit, 3Department of Advanced Medical Technology Development in Research and Development Initiative Center, National Cerebral and Cardiovascular Center, Japan

**Purpose:** To assess recanalization rate of occluded artery following IV rt-PA therapy by MRA, DSA, or TCCS in acute ischemic stroke patients.

**Methods:** We enrolled acute ischemic stroke patients who were treated with IV rt-PA. Pretreatment MRA was routinely performed to detect occluded culprit artery. Recanalization status was evaluated on MRA, DSA, or TCCS at 1, 2, 24 hours and 14 days following rt-PA therapy. Outcome measures were M1 recanalization rates, symptomatic intracranial hemorrhage (a deterioration in NIHSS score ≥ 4 from baseline) within 36 hours and favorable outcome (modified Rankin Scale score, 0-1) at 3 months after stroke onset.

**Results:** Of a total of 354 patients (228 men, age 73 ± 13) enrolled, the internal carotid artery was occluded in 58 patients, the middle cerebral artery (M1, M2 and branches) in 163, other arteries in 106, and MRA was not done in the remaining 27. Complete or partial M1 recanalization was found in 50% at 1 hour after the initiation of IV rt-PA, in 51% at 2 hours, in 57% at 24 hours and in 74% at 14 days. Symptomatic intracranial hemorrhage was observed in 2% and the favorable outcome at 3 months was in 37%.

**Conclusions:** On the basis of these historical data, we just start to make a clinical trial protocol of newly developed sonothrombolysis system for acute ischemic stroke patients.

**Keywords:** rt-PA, M1 occlusion, recanalization, symptomatic
intracranial hemorrhage, modified Rankin Scale

__Symposium 3__

Ultrasound in management of carotid artery diseases

**S-3-1**

**Association between carotid plaque echogenicity and the risk of cardiovascular disease in atherosclerotic high-risk patients**

Yasuhiro Tadokoro, Shuhei Okazaki, Shigetaka Furukado, Kaori Miwa, Mari Matsumoto, Yoshiki Yagita, Manabu Sakaguchi, Mochizuki Hideki, Kazuo Kitagawa

Department of Neurology, Osaka University Graduate School of Medicine, Osaka, Japan

**Methods and Results:** Ultrasound assessment of carotid plaque echogenicity with integrated backscatter analysis (Yamagami H et al. Stroke, 35:677-681, 2004) was performed in 625 patients with any history of cardiovascular events or with at least one risk factor, who were enrolled between 2001 and 2006 in OSACA2 study (Kitagawa K et al., Cerebrovasc Dis, 24:35-42, 2007). At June, 2011, we surveyed the cardiovascular events, including stroke, coronary artery disease (CAD), peripheral artery disease (PAD) and vascular death. During follow-up, 134 cardiovascular events occurred, including 53 stroke, 40 CAD, 13 PAD and 28 vascular death. In a multivariate Cox hazard analysis with adjustment for age, gender, history of cardiovascular events, risk factors and plaque size, plaque echolucency (lower IBS value) was a significant predictor of cardiovascular events (HR, 1.46, P<0.05). In patients with plaque size > 2.0 mm (n=335), plaque echolucency was a significant predictor (HR 1.87, P<0.05), but in those with plaque size ≤ 2.0 mm (n=290), no relation was observed between plaque echolucency and vascular events.

**Conclusions:** Measurement of echolucency of the carotid plaque could be useful for assessment of future risk of vascular events, especially in patients with medium- or large-sized plaque.

**Keywords:** carotid plaque, echogenicity, cardiovascular event

**S-3-4**

**Correlation of peak systolic velocity, ECST method and acceleration time in internal carotid artery stenosis**

Misako Mori, Yuki Kamiya, Ayako Kuriki, Hiroo Ichikawa

__Purpose:__ The aim of this study was to investigate correlations of peak systolic velocity (PSV), diameter stenosis (ECST method) and acceleration time (AcT) and to clarify the each characteristic in internal carotid artery (ICA) stenosis.

**Methods:** We evaluated 44 ICAs which had more than 100 cm/s of PSV. ECST and PSV were measured at a site of most striking stenosis by using linear-array probes, and AcT was measured at distal ICA adequately away from stenosis by convex-array probes.

**Results:** There were significant correlations between PSV and ECST, and between PSV and AcT (correlation coefficient r =0.51 and 0.61, respectively). But the correlation between PSV and ECST had varied greatly, and AcT had a closer correlation with PSV than ECST. In some cases, there was not a marked elevation in PSV despite severe stenosis. But AcT had a good correlation with ECST even in extremely severe stenosis. An AcT of more than 135 msec suggested severe stenosis (more than 200 cm/s of PSV).

**Conclusions:** PSV and AcT were available to assess ICA stenosis. Especially, AcT was capable of making an accurate assessment of more severe stenosis.

**Keywords:** internal carotid artery stenosis, acceleration time, carotid ultrasonography

__Symposium 4__

Peri- and intra-operative neurosonology

**S-4-1**

**Prediction of hallucination following carotid endarterectomy by duplex ultrasonography**

Yohei Tateishi, Akira Tsujino, Osamu Tasaki, Nobutaka Horie, Kentaro Hayashi, Izumi Nagata

1Cerebrovascular Center, Nagasaki University Hospital, 2Emergency Medical Center, Nagasaki University Hospital, 3Department of Neurosurgery, Nagasaki University Hospital, Japan
Background: The aim of this study was to identify the association between flow velocity at a distal site of internal carotid artery (ICA) stenotic lesion and hallucination after carotid endarterectomy (CEA).

Methods: Consecutive patients who underwent CEA were enrolled. The flow velocity at the distal site of the stenotic lesion was assessed by carotid duplex ultrasonography before CEA. The development of hallucination and cerebral hyperperfusion syndrome (CHS) after CEA were assessed by reviewing medical records. CHS was diagnosed if patients developed confusion, seizure or intracranial hemorrhage after CEA. Univariate and multivariate analysis were conducted to identify predictors of development of hallucination following CEA.

Results: Sixty-two patients were enrolled in this study excluding three patients. Hallucination occurred in 9 patients (15%). Patients who developed hallucination were associated with CHS (67 % versus 6 %, p<0.001), higher age (p=0.136) and decreased mean flow velocity (17 versus 33 cm/s, p=0.001). In multivariate analysis, decreased mean flow velocity at the distal site of stenotic lesion was an independent predictor of development of hallucination following CEA. The cut-off value was 18cm/s.

Conclusions: The decreased mean flow velocity at the distal site of the carotid stenosis was related to development of hallucination after CEA.

Keywords: Hallucination, Carotid endarterectomy, Carotid duplex ultrasonography

S-4-3
The perioperative sonographic study on the patients with intracranial diseases

Tsutomu Nakaoka
The department of Neurosurgery, Hoya Kosei Hospital, Tokyo, Japan

Purpose: The usefulness of perioperative ultrasound sonography (US) during neurosurgical procedures

Methods: The 469 cases were objective. The instrument is HDI5000 and iE-33 (Philips), linear probe (L12-5) and Matrix array. The modalities were B-mode and Color Flow Mapping (CFM), Pulse Inversion Harmonic imaging with contrast agents (IClip), 3D image by volume imaging method (V1). The pre-processing data analysis by QLAB, time intensity curves (TIC) and Color coded Imaging (CCI) were made.

Results: The cerebral infarction on the acute stage discriminated from Grade I (normal) from Grade V (complete disturbance) by B-mode. There was some mismatch between B-mode and MRI findings. In addition to the microcirculation (MC) was observed on the parts of Gr.IV & V on the acute stage. The MC was usually observed within 1 week after onset and the same parts changed to scar after 2 months. We usually use the US modalities preventing the perioperative complications on the patients with ICH, AVM, tumor and aneurysm.

Case: He admitted our hospital by the massive left parietal sub-cortical hematoma. His neurological states were aggravated progressively. So we decided to operate without angiography. The intraoperative CFM revealed the mosaic signals by AVM, so we continued the operation under the sonographic monitoring and cured completely.

Conclusions: US were useful as the perioperative monitoring providing us many information. There’re some mismatch findings between US and other diagnostic instruments.

Keywords: Perioperative monitoring, brain tumor, cerebrovascular disturbance

S-4-4
Four-dimensional ultrasound imaging during neurosurgical operation: Advantages and disadvantages

Yoshiaki Kumon1, Hideaki Watanabe2, Masahiko Tagawa1, Shirou Ohue1, Takanori Ohnishi1, Keiji Igase2, Masamori Arai2, Ichirou Matsubara3, Atsushi Goishi2, Kazuhiko Sadamoto2
1Department of Neurosurgery, Ehime University Graduate School of Medicine, 2Department of Neurosurgery, Washoukai Sadamoto Hospital, Japan

Purpose: The aim of this study was to clarify both the advantages and disadvantages of four-dimensional (4D) ultrasound imaging during neurosurgical procedures.

Methods: The findings from 81 surgical procedures (brain tumors, n = 41; cerebrovascular diseases, n = 40) using a Voluson 730 Expert or an E8 (GE) 4D ultrasound system were assessed. In some cases, 2D ultrasound imaging linked with navigation system (SonoNav system, GE) was also used.

Results: 3D images revealing the anatomical relationships between lesions and surrounding brain structures such as vessels and ventricles were easily acquired using the 4D ultrasound system; therefore, both residual tumors and preserved vessels were evident. SonoNav system was able to simultaneously show identical sections of magnetic resonance (MR)/computed tomography (CT) images with ultrasound images; therefore, ultrasound images of oblique sections were easily interpreted and intraoperative brain shifts could be recognized. However, ultrasound images sometimes became unclear during the later stages of surgery,
even when using the 4D system.

**Conclusions:** Our results suggest that relationships between lesions and surrounding brain tissues can be revealed on 4D ultrasound imaging; therefore, the use of 4D ultrasound imaging during neurosurgical procedures can help to ensure the appropriateness of the procedure.

**Keywords:** 4-dimensional ultrasound, intraoperative imaging, neurosurgery

S-4-5

**Usefulness of intraoperative ultrasonography in resection of central nervous system tumors**

Tsuyoshi Izumo, Takayuki Matsuo, Kamada Kensaku, Kentaro Hayashi, Izumi Nagata
Department of Neurosurgery, Nagasaki University School of Medicine, Japan

**Purpose:** The aim of this study was to evaluate the usefulness of intraoperative ultrasonography in combination with navigation systems.

**Methods:** Between June 2012 and December 2012, 16 patients with intra-axial brain tumors underwent surgery using a SonoSite ultrasonography, a StealthStation™ navigation system, and a SonoNav™ system. The ultrasonographic image was directly integrated into the navigation system, and the findings were compared with the preoperative images.

**Results:** Intraoperative ultrasonography-linked navigation provided information about brain shift and extent of resection during surgery. Using this type of assistance, total resection was achieved in 10 of 16 cases, subtotal resection in 6. No operative complication was observed.

**Conclusions:** Intraoperative ultrasonography supported by a navigation system improves the quality assurance of image-guided neurosurgery.

**Keywords:** Ultrasound, burr hole surgery, endoscopic surgery

Symposium 5

**Documentation sheets of carotid ultrasound**

S-5-2

**How to report the ultrasonic findings of internal carotid artery stenosis ~My Report~**

Tomoya Mukai, Naohisa Hosomi, Masayasu Matsumoto
Department of Neurology, Hiroshima University Hospital, Hiroshima, Japan

How to report the findings is a major concern among neurosonologists. In Japan, we don’t have standardized format for the cervical ultrasound report. We show our report format and make a case presentation on typical internal carotid artery stenosis (ICS). We propose how to assess the findings, how to draw, and how to report the case.

**Case:** Eighty-year-old male was referred to our institute because of symptomatic ICS. This patient had a mixed plaque with severe stenosis (NASCET 86%, ECST 88%, Area 90% and flow...
max velocity 320 cm/sec). The follow up examination was done by the same neurosonologist and the findings still remained (NASCET 83%, ECST 86%, Area 92% and flow max velocity 349 cm/sec). Carotid artery stenting was underwent to this patient and follow up examination demonstrated excellent stent patency.

In our hospital, we are making the best effort to assess the ICS accurately. It is essential for us to evaluate the stenosis with many parameters: plaque size, character, NASCET, ECST, Area and flow max velocity. It is also important to make a report accurately and concisely. High quality reports contribute to the patients.

Keywords: Report format, internal carotid artery stenosis, neurosonologist

S-5-4
Report of carotid artery ultrasonography in Dokkyo Medical University

Ryuta Okabe1, Hidehiro Takekawa1, Koichi Hirata2
1 Stroke Division, Department of Neurology, Dokkyo Medical University, Tochigi, Japan, 2 Department of Neurology, Dokkyo Medical University

In our hospital, we perform carotid artery ultrasonography in approximately 900 patients per year. The clinical backgrounds of the patients were the following: cerebrovascular diseases, 55%; evaluation for carotid artery stenosis (before and after carotid artery stenting), 14%; preoperative evaluation for open heart surgery (coronary artery bypass surgery and heart valve replacement surgery), 9%; screening Purposes, 26%. The common carotid artery, internal carotid artery, external carotid artery and vertebral artery are routinely examined. In addition, transcranial sonography in the middle cerebral artery and basilar artery, detection of right-to-left shunts with the use of the internal carotid artery (approximately 80 patients annually), lower extremity Doppler (approximately 70 patients annually) and screening for aortic arch atherosclerosis, brachial artery may be performed as needed. In the report, we describe plaque score, properties of plaque, max intima-media thickness, and end-diastolic ratio. In addition, we describe stenosis ratio i.e. diameter ratio (NASCET and ECST methods), area stenosis and peak systolic velocity, at the stenosis point.

In our hospital, we use a hand-written report and an original report which links to electric medical records. At this time, because we have to fill out 2 different types of reports, further adjustments are required.

Keywords: reporting system, carotid ultrasonography

S-5-5
Reporting carotid ultrasonography at the National Cerebral and Cardiovascular Center

Ryo Shimomura1, Rieko Suzuki1, Masatoshi Koga2, Kozue Saito3, Hiroshi Yamagami4, Kazuyuki Nagatsuka4, Kazunori Toyoda4, Kazuo Minematsu1
1 Department of Cerebrovascular Medicine, 2 Division of Stroke Care Unit, 3 Department of Neurology, National Cerebral and Cardiovascular Center, Osaka, Japan

We annually conduct about 5, 000 carotid ultrasonography examinations mainly to evaluate patients with acute stroke in the stroke care unit, and to screen those with high vascular risk and to follow up those with carotid artery lesions at clinic. We use a diagrammatic representation of pathology which depicts the characteristics and site of the atherosclerotic plaque and stenosis. We describe side-to-side ratios of flow velocities in the common carotid artery to understand the flow laterality which usually indicates severe stenosis or occlusion of the internal carotid artery or the main trunk of the middle cerebral artery. We measure carotid artery stenosis using an area stenosis method, a diameter stenosis method and peak flow velocity if there is a diameter stenosis ≥50%. We also record a lesion length of stenosis, a minimum residual lumen diameter and a post stenotic flow velocity. There are several problems for reporting carotid ultrasonography. First, reporting manners may be different among examiners. Next, it takes extra time to make a report. Third, it is sometimes difficult to compare the findings of reports between two hospitals because there is no standard reporting system so far. The standardization of reporting may also help our better cooperation between hospitals.

Keywords: report, carotid ultrasonography, standardization

S-5-6
Development of the carotid ultrasound report in Shimane University Hospital

Fumio Nakagawa1, Hidemasa Nagai1, Hirotake Ede1, Shinya Hagiwara1, Mitsuhiro Daisu1, Takeshi Uemura1, Takeshi Miyazaki1, Yasuhiko Akiyama1, Seiko Uno1, Yasuko Notu2
1 Department of Neurosurgery, Shimane University Faculty of Medicine, 2 Central Clinical Laboratory, Shimane University
Hospital, Shimane Japan

The carotid ultrasound report had the characteristics of the each hospital. Although the electrical medical system was introduced to our institute in 2006, the carotid ultrasound report was changed from paper-based records to the electrical records in 2008.

The format of carotid ultrasound report was constructed by diabetic internal medicine, neurology and our neurosurgery department which was focused on the perioperative management in the carotid artery stenting. B-mode was measured the vessel’s diameter, maximum intima-media thickness of bilateral arteries (common carotid, carotid bulb, internal carotid, vertebral), total plaque score and stenosis rate of both area method and European Carotid Surgery Trial method in the internal carotid artery. Doppler-mode was measured the peak systolic flow velocity, the end-diastolic flow velocity, mean flow velocity, pulsatility index and resistance index.

The important thing was the impression of sonographer. The schema written by sonographer using a built-in drawing tool was very useful for attending physician to understand the patient’s carotid situation, however it was a time-consuming task. The more increasing number of carotid ultrasound examination is, the more time to draw a schema it is taken. The development of carotid ultrasound report is still ongoing. We need the more sophisticated report.

**Keywords**: carotid ultrasound, report

---

**Symposium 6**

Deep discussion of various stroke cases : topics in neurosonology

**S-6-2**

A case of paradoxical embolism in a patient with prominent Eustachian valve and autoimmune bullous dermatosis

Takeshi Imai, Takahiro Shimizu, Kazuhiko Hanzawa*, Yasuhiro Hasegawa

Departments of Internal Medicine, Division of Neurology, St. Marianna University School of Medicine, Kawasaki, Japan, *Division of Thoracic and Cardiovascular Surgery, Niigata University Graduate School of Medical and Dental Sciences, Niigata, Japan

Evidence has been accumulated that patients with Bullous Pemphigoid (BP) have an increased risk of stroke and particularly ischemic stroke. The Eustachian valve (EV) is known to be an embryological remnant of the inferior vena cava (IVC) valve that prenatally directs the oxygenated blood from the IVC across the patent foramen ovale (PFO) into systemic circulation. Even when the EV is prominent, it is usually considered to be a benign finding in the absence of associated cardiac anomalies. We present a patient with BP and PFO whose prominent EV increased spontaneous right-to-left shunt and promoted paradoxical cerebral embolism. A 77-year-old female with BP was admitted because of the left hemiparesis. Magnetic resonance imaging of brain revealed restricted diffusion in the right frontal lobe. Transesophageal echocardiogram using contrast saline detected PFO and EV at the junction of the IVC and the right atrium and promoted paradoxical cerebral embolism. Oral anticoagulation was started. Although elevated levels of cytokines and endothelial damage are thought to be related to increased risk of stroke, precise mechanism has not yet been elucidated. Pathogenetic mechanism associated with EV should not be overlooked in the thrombophilic state in patients with BP.

**Keywords**: Eustachian valve, patent foramen ovale, paradoxical cerebral embolism, autoimmune bullous dermatosis

---

**S-6-4**

2 cases of ischemic event in the hippocampus with acute amnesia due to aortogenic brain embolism diagnosed by using transesophageal echocardiography

Satomi Mezuki, Shigeru Fujimoto, Satoshi Suzuki, Takayuki Matsuki, Ryosuke Tsuchimochi, Takuya Inoue, Jyuro Jinnouchi, Takao Ishitsuka

Stroke Center, Steel Memorial Yawata Hospital, Japan

Case 1 was a 77-year-old man. One day he came to our hospital because he lost almost all memories of the daily work of the day before. MRI DWI study revealed spotty high intensity lesions in the bilateral hippocampus, which would be responsible for the amnesia. Transesophageal echocardiography showed the severe aortic arch atheroma of 6.8mm in diameter. We diagnosed that he had an aortogenic embolism to the bilateral hippocampus. Case 2 was a 66-year-old woman. One day she came to our hospital because of a transient amnesia. She lost all memories during 5 hours while she were out and she had an anterograde amnesia on the day. MRI DWI study revealed no ischemic lesion, but MRA revealed the branch occlusion of the right posterior cerebral artery. MRA on the 7th hospital day revealed the partial recanalization. Transesophageal echocardiography showed...
aortic arch atheroma of 3.9mm in diameter with extension to the branch. In these 2 cases, the embolism to the hippocampus might be causally related to them. Some reports revealed the relationship between patent foramen ovale and transient global amnesia. In the present cases, the aortic arch atheroma can be a possible embolic source and transesophageal echocardiography is very useful to evaluate those findings.

**Keywords:** Amnesia, Aortic arch atheroma, Transesophageal echocardiography

---

**S-6-6**

The cerebral infarction related to bilateral carotid arterial dissection with polycystic kidney disease patient.

Sono Toi1,2, Saori Moriya1, Satoko Mizuno1, Yukiko Tsutsumi2
1Tokyo Women’s Medical University Yachiyo Medical Center, Chiba, Japan, 2Department of Neurology, Tokyo Women’s Medical University, Tokyo, Japan

Polycystic kidney disease (called PKD) is a hereditary disease, characterized by polycystic formation of the liver and kidney, responsible for chronic renal failure. It is known that cerebral aneurysms are often associated with PKD cases, suggesting a possible role for vascular vulnerability. We experienced a case of cerebral infarction caused by carotid dissection after renal transplantation, and followed up with repeated carotid ultrasonography (US) studies. The case was a 53-year-old man. His mother died of idiopathic renal failure and ischemic stroke. There was no previous history. He was diagnosed as having PKD at 43 year of age, and hemodialysis was started at 51 year of age. Next year, he underwent living-donor renal transplantation on taking immunosuppressant agents. Two weeks later, he noticed tenderness around neck, dull pain around face and mandible, and dysphagia. Two days after, he visited our clinic. After neck palpitation, dysarthria and right hemiplegia suddenly occurred. MRI demonstrated acute ischemic stroke in left cerebral hemisphere with obscure stenosis of ipsilateral internal carotid artery (ICA) at orifice on MRA. At the same day, carotid US study revealed a complete occlusion of left ICA probably due to dissection, and medication was started. After then, contralateral carotid arterial dissection was suspected without any stroke episode. In the following US studies, increased brightness of the carotid artery lesion appeared. Thus, carotid US study is a useful for following up of carotid artery dissection lesions as a cause of cerebral infarction in a PKD case.

**Keywords:** Polycystic kidney disease, stroke, ultrasonography

---

**S-6-10**

Carotid ultrasonography can help to determine diagnosis and therapeutic effect - Case report of temporal arteritis

Hirotoshi Hamaguchi1, Noriko Fukuzumi2, Hitomi Kousaka2, Tsumugi Oki2, Fumio Kanda1
1Department of Neurology, Kobe University Hospital, 2Department of Clinical Laboratory, Kobe University Hospital, Japan

A 77-year-old woman developed weakness in the left arm and diplopia at five and two months before admission, respectively. Cerebral magnetic resonance imaging (MRI) identified infarction at the right pons and left middle brain. Blood findings revealed a high inflammatory response. Carotid ultrasonography identified localized thickening of the intima–media complex (IMC) in the bilateral common carotid artery (CCA), and temporal artery ultrasonography recognized the halo sign. A temporal artery biopsy of the same site confirmed a diagnosis of temporal arteritis. Oral steroid quickly improved the inflammatory reaction; however, the diplopia and upper limb weakness persisted. Neck ultrasonography revealed the halo sign and stenosis in the bilateral subclavian artery. The patient underwent balloon dilation to the stenosis of the bilateral subclavian artery and the proximal brachial artery.

**Discussion:** Vasculitis on echo imaging, the halo sign in the temporal arteries, and the macaroni sign all represent established signs of Takayasu arteritis. Ultrasonography led to a definitive diagnosis of temporal arteritis as the cause of cerebral infarction in this patient. Furthermore, ultrasonography was useful for observing balloon dilation enforcement around two adaptations and confirming the results of endovascular therapy.

**Keywords:** Carotid ultrasonography, temporal arteritis, cerebral infarction

---

**Oral Presentations**

**Session1: Congenital childhood disorders**

**O-1-1**

A case of expectant management in Rh-E immunized pregnancy by assessment of peak velocity of systolic blood flow in fetal middle cerebral artery

Ryuji Mitani1, Yuri Yamamoto1, Yuka Miyatani1, Masahiko Maegawa1, Kenichi Suga2, Kazuhiro Mori2, Kensaku Takase3
Objective: Maternal red-cell alloimmunization is known to cause fetal hydrops. Although invasive techniques such as amniocentesis and cordocentesis have been used for diagnosis and treatment, recent study demonstrated that moderate and severe fetal anemia can be detected by the peak velocity of systolic blood flow in fetal middle cerebral artery (MCA-PSV). We report a case of expectant management in Rh-E immunized pregnancy by assessment of MCA-PSV.

Case: A 35-year-old woman, gravid 3, para 2, had anti-E anti-c antibodies sensitized in her previous pregnancies. A titer of indirect Coombs test was 1 in 16 at 23 weeks of gestation. Although a titer of indirect Coombs test was elevated to 1 in 64 at 30 weeks of gestation, expectant management without amniocentesis was chosen because fetal MCA-PSV was still lower than a cutoff of 1.5 multiple of the median. There was no evidence of fetal hydrops. She gave birth to a female infant of 3190 g at 39 weeks of gestation. The infant’s hematocrit and hemoglobin levels were normal.

Conclusions: Serial measurements of MCA-PSV is an useful method to evaluate fetus without hydrops that is at risk due to maternal red-cell alloimmunization.

Keywords: Rh-E immunized pregnancy fetal anemia MCA-PSV

O-1-2
Brain echo imaging of posterior fossa subdural hematoma in neonate
Asami Maruyama, Yuiko Sato, Ko Ichihashi
Department of Pediatrics, Saitama Medical Center Jichi Medical University, Saitama, Japan

A girl was born in vacuum extraction with 40 weeks of gestational age, 2714g of birth weight, 9 points of Apgar scores. On day 1, she was transported to our NICU because of poor feeding, frequent vomiting and cyanosis. The brain echo revealed a hypoechoic area in the left posterior fossa and dilation of the cerebral ventricles. The head CT showed the high density lesion in the same area and the patient was diagnosed with posterior fossa subdural hematoma. She was transferred to the other hospital for surgery. After the operation of hematoma removal, her oral feeding increased and she was discharged on day 17.

Early diagnosis of posterior fossa subdural hematoma is important, because patients conditions worsen rapidly and they might die. Difficulty of detection of hematoma in the posterior fossa by brain echo and the usefulness of head MRI and CT as definitive diagnosis has been reported. However, we concluded that hypoechoic area in the left posterior fossa and ventricular dilatation detected by brain echo are decisive role to diagnose posterior fossa subdural hematoma.

Keywords: posterior fossa subdural hematoma, neonates, brain echo

O-1-3
Muscle ultrasonography in a case of juvenile dermatomyositis
Kengo Sato¹, Yoshihiro Maegaki², Chisako Fukuda¹, Yasuaki Hirooka¹
¹Department of Pathobiological Science and Technology, School of Health Science, Tottori University, Yonago, ²Neuropediatrics, Tottori University Hospital, Yonago, Japan

Background: Magnetic resonance imaging (MRI) and electromyography (EMG) have been previously used in the diagnosis of juvenile dermatomyositis (JDM), but these methods are invasive and associated with a high risk of radiation poisoning. In contrast, ultrasonography (US) is not associated with any of the abovementioned risks. Here, we report the usefulness of muscle US in the diagnosis of JDM.

Case Summary: A 10-year-old girl with a history of atopic dermatitis presented with red rash on her face. She also showed Gottron’s sign, muscle weakness, and increased enzyme serum levels. MRI showed marked enlargement of the muscles, suggesting inflammation. Additionally, muscle biopsy showed positive results and US revealed a hyperechoic area. On the basis of these findings, she was diagnosed with dermatomyositis. She was subsequently started on steroid therapy, after which MRI and US showed improved results. However, because MRI later showed enlargement of muscles and increased enzyme serum levels, we believed that her condition was exacerbated. At this point, US showed a hyperechoic area in the same region where MRI showed abnormal results. She was subsequently administered VI pulse therapy with cyclophosphamide, following which her symptoms improved.

Discussion: Muscle US provides the same degree of resolution as MRI and may be useful in the diagnosis of myositis, monitoring the progress of progress, and evaluation of the curative effect.

Keywords: ultrasonography, muscle, juvenile dermatomyositis
**O-1-4**

**Champagne bottleneck sign in stroke patients with Moyamoya or akin-Moyamoya disease**

Emi Tabata¹, Yukihiro Wakugawa¹, Yoshiki Sanbongi¹,², Koichiro Maeda¹, Masahiro Yasaka¹, Tomoyuki Tumoto², Shinji Nagata¹, Yasushi Okada¹

¹Department of Cerebrovascular Medicine and Neurology, National Hospital Organization Kyushu Medical Center, ²Department of Intravascular surgery, National Hospital Organization Kyushu Medical Center, Japan

**Purpose:** We investigated the relevance of cerebrovascular disease and the Champagne bottleneck sign in patients with moyamoya or akin-moyamoya disease.

**Methods:** We examined 82 ICA in 41 moyamoya or akin-moyamoya patients used for MRA, CT angiography, angiography or conventional carotid ultrasonography. We also interviewed for medical history, vascular risk factor (hypertension, dyslipidemia, diabetes mellitus, smoking) and history of stroke. Champagne bottle neck sign is defined as the diameter of the internal carotid artery is less than 50% of the diameter of the common carotid artery.

**Results:** This Champagne bottleneck sign was present at 24 ICAs (29%) in 82 ICAs. Cerebral hemorrhage occurred in 2 ICA territories (2.5 %), TIA in 13 ICA territories (16 %), cerebral infarction in 18 ICA territories (22%), both cerebral infarction and hemorrhage in 2 ICA territories (2.5%) positive side to the Champagne bottleneck sign. On the other hand, we found TIA in 7 ICA territories (12%) and cerebral infarction in 9 ICA territories (16%), negative side to the sign. Then any cerebrovascular events occurred more frequently in ICA positive than in ICA negative for the sign. Incidence of other risk factors for cerebrovascular disease (hypertension, dyslipidemia, smoking, diabetes) did not differ among the groups.

**Conclusions:** Champagne bottleneck sign is strongly associated with the onset of cerebrovascular disease in patients with moyamoya or akin-moyamoya disease.

**Keywords:** Champagne bottleneck sign, stroke, moyamoya disease

**O-1-5**

**Characteristics of Ophthalmic Artery Flow in Moyamoya Disease**

Shoichiro Kawaguchi, Jun-ichi Iida, Yoshitomo Uchiyama, Yukiko Korani

Department of Neurosurgery, Nara Prefectural Nara Hospital, Japan

**Background:** The aim of this study was to clarify typical sonographic features of the ophthalmic artery (OA) in moyamoya disease.

**Methods:** Fifty-eight moyamoya disease patients were examined. Their initial symptoms were ischemic attack in 41 and intracranial hemorrhage in 17 patients. Using color Doppler flow imaging, the Vs and PI were evaluated on the symptomatic side OA.

**Results:** 1) The average Vs was 0.43 m/sec, which was significantly (p<0.05) higher, and the average PI was 1.09, which was significantly (p<0.05) lower compared to the controls. 2) Comparison with ischemic patients, the hemorrhagic patients showed significantly higher average Vs and significantly lower average PI values (p<0.05). 3) 22 patients showed the high hemodynamic stress stage defined as follows: Vs more than or equal to 0.43 m/sec and PI less than or equal to 1.17. Among them, 15 (68%) presented with intracranial hemorrhage. The incidence of hemorrhagic episodes was significantly higher in the high hemodynamic stress stage patients (p<0.05).

**Conclusions:** High OA Vs and low PI values are characteristic in moyamoya disease, and these findings are significantly marked in hemorrhagic type moyamoya disease. Patients with OA in the high hemodynamic stress stage showed a high incidence of intracranial hemorrhagic events.

**Keywords:** moyamoya disease, ophthalmic artery flow, Doppler sonography

**O-1-6**

**Transorbital sonography of the superior orbital vein in spontaneous carotid-cavernous sinus fistulas: analysis of a red-eyed case and a white-eyed case**

Taro Okunomiya¹, Sadaharu Torikoshi², Kanta Tanaka¹, Daisuke Kambe¹, Ilko Wada¹, Atsushi Shima¹, Akiyo Shinde¹, Takashi Kageyama¹, Yoshinori Akiyama², Toshihiko Suenaga¹

¹Department of Neurology, Tenri Hospital, ²Department of Neurosurgery, Tenri Hospital, Japan

**Purpose:** To report transorbital sonographic findings in spontaneous CCF.

**Methods:** Transorbital sonography was performed with a LOGIQ 7 system (GE Healthcare, US) using linear transducers.
in two patients with spontaneous Barrow’s type D CCF.

Results: [Case 1] A 60-year-old woman presented with chemosis and ophthalmoplegia on her right eye without bruit since 21 months earlier. Digital subtraction angiography (DSA) revealed CCF fed by the right middle meningeal artery (MMA) and right internal carotid artery (ICA) with venous congestion in the right SOV. Transorbital Doppler sonography showed reversed flow in the right SOV with a maximum velocity of 7.4 cm/s.

[Case 2] A 62-year-old man presented with throbbing headache and intermittent chemosis on his left eye since 5 month earlier. On examination, exophthalmos, chemosis, and bruit were not found. DSA revealed CCF fed by the left MMA and left ICA without congestion in the left SOV. Transorbital sonography showed a to-and-fro bidirectional Doppler waveform in the left SOV with a maximum velocity of 3.6 cm/s in anterograde flow and 4.4 cm/s in retrograde flow.

Conclusions: Transorbital sonography of SOVs revealed retrograde flow in a red-eyed CCF and a to-and-fro bidirectional flow in a white-eyed CCF.

Keywords: Carotid-cavernous fistula, transorbital sonography, superior orbital vein

Oral Presentations

Session 2: Carotid plaque / Tissue characteristics

O-2-1
Detection of vulnerable carotid artery plaques with B-mode ultrasonography

Yoko Kimura1, Masafumi Tagaya2, Yuko Sakamoto1, Eriko Itoh1, Boohan Hyun1, Shiro Yamamoto1, Keiko Nagano1, Hideki Etani1
1National Hospital Organization Osaka National Hospital Osaka, Japan, 2Tagaya Clinic

We report a 65-year-old man with bilateral radiation-induced carotid stenosis who had undergone focal radiation therapy at cervix 11 years earlier to oropharyngeal cancer.

He developed transient proximal weakness of his left upper limbs. MRI showed multiple small infarcts and carotid ultrasonography revealed a high-grade stenosis with an ulcerative and a mobile plaque in the left common carotid artery (CCA), severe stenosis in the left internal carotid artery (ICA) and a moderate stenosis with a long isoechoic plaque in the right CCA. Although we started antiplatelet therapy, recurrent ischemic stroke in left hemisphere nine months later. Ultrasonography revealed progression of the left ICA stenosis, an enlarged plaque with jellyfish sign, and another mobile plaque in the left CCA. Sixteen days later, ultrasonography showed mobile plaque emerged in not only left CCA, but also right CCA, and left ICA occluded. In addition, although we took several antithrombotic therapy, small infarcts increased.

We diagnosed microemboli arising from the stump of the occluded left ICA pass into the MCA circulation. We added warfarin therapy and no recurrent stroke was noted.

In summery, patients, received radiotherapy to the neck, have a high risk of developing significant bilateral carotid stenosis, so we should follow up asymptomatic carotid stenosis not limited to symptomatic carotid stenosis.

Keywords: radiation therapy, carotid stenosis, mobile plaque

O-2-3
Observations of neovascularization in carotid plaque using 4-dimensional contrast-enhanced ultrasound

Kazumasa Oura1, Hideki Ohba1, Minori Shigemasa4, Masakazu Kobayashi2, Kunikai Ogasawara2, Jiro Hitomi3, Yasuo Terayama1
1Department of Neurology and Gerontology, 2Department of Neurosurgery, 3Department of Anatomy, Iwate Medical University, Morioka, Japan, 4GE Healthcare Japan Corporation, Tokyo, Japan

Purpose: In recent years, neovascularization fragility within plaque has been reported to be a factor in instable plaque. However, they are difficult to detect with ultrasonography. In this study, small vessels (vasa vasorum or neovascularization) entering carotid plaque were observed by 4-dimensional ultrasonography using contrast agent to evaluate their morphology.

Subjects: Subjects comprised inpatients and outpatients with internal carotid artery stenosis who had visited the departments of Neurology and Gerontology, and Neurosurgery, at Iwate Medical University Hospital and in whom carotid endarterectomy was indicated.

Methods: Prior to carotid endarterectomy, contrast-enhanced 4-dimensional carotid ultrasonography was performed using powerbucane as the ultrasound contrast agent. Using a Voluson E8 (GE Healthcare Japan) 4-dimensional ultrasonography system, small vessels entering plaque were assessed 4-dimensionally and over time in both 2D and 3D/4D mode. Pathological specimens obtained in the endarterectomy and findings from the 4-dimensional ultrasonography were compared and investigated pathologically.
Results: With contrast-enhanced 4-dimensional ultrasonography, it was possible to observe 4-dimensionally the consecutive neovascularization within plaque and course of the vasa vasorum, which cannot be observed with conventional ultrasonography.

Discussion: Neovascularization within plaque is a cause of bleeding and an important factor in plaque instability. Detailed assessment of neovasculature is useful for evaluating plaque instability.

Keywords: Carotid Artery, Contrast, 4-Dimensional

O-2-6
Change of carotid plaque by the treatment of EPA and Rosuvastatin - Differences in change between IVUS and MRI -

Motoshi Sawada, Yuto Yasokawa, and Daisuke Mizutani
Department of Neurosurgery, Matsunami General Hospital, Gifu, Japan

Based on the results of prospective randomized clinical trial evaluating combined effects of eicosapentaenoic acid (EPA) and rosuvastatin on carotid plaque, we assessed differences in change of carotid plaque by both drugs under magnetic resonance plaque imaging (MRP) and intravascular ultrasound (IVUS). Thirty consecutive patients with carotid stenosis were randomly divided into two groups such as EPA/rosuvastatin group (n=15) and control group (n=15), and then were treated with carotid artery stenting (CAS). Perioperative complications and postoperative high spotty lesions on diffusion-weighted image (DWI) were compared between two groups. Judging from 20 carotid endarterectomy (CEA) candidates, MRI can accurately distinguish the vulnerability plaque using Sp/Sm ratio calculated with the signal intensity of carotid plaque (Sp) compared to that of sternocleidomastoid muscle (Sm). As a result, EPA/rosuvastatin significantly reduced the Sp/Sm ratio in patients with unstable plaques and plaque volume was also reduced in 4 of 15 cases treated with EPA/rosuvastatin. Therefore, the number of postoperative high spotty lesions on DWI significantly decreased in EPA/rosuvastatin group (13%; 2/15) compared with control group (40%; 6/15, p<0.05), whereas no significant difference was observed in perioperative complication rate. EPA/rosuvastatin leads to a beneficial effect on plaque composition and volume, particular in patients with vulnerable plaque.

Keywords: IVUS, MR plaque imaging, plaque vulnerability

Oral Presentations

Session 3: Ultrasound in medical examination / Brain dock

O-3-1
Relationship between mean common carotid intima-media thickness and aortosclerosis

Kentaro Fujishiro and Masahiko Harada*
Office of Educational Development, School of Med. Faculty of Med., Toho University, Clinical Functional Physiology, Omori Medical Center, Toho University, Tokyo, Japan

Purpose: We examined the degree of mean intima-media thickness (IMT) in comparison with pulse wave velocity (PWV) and cardio-ankle vascular index (CAVI), which are used as measures of aortosclerosis.

Methods: We selected 730 patients (403 men) with plaque score ≤5, between 2005 and 2008. Mean ages were 54.0 for men and 58.5 years for women. Mean IMT was determined by taking the mean values at three plaque-free points measured by carotid ultrasonography. PWV was corrected at a diastolic blood pressure of 80 mmHg.

Results: Among patients with aortosclerosis, 66 patients showed a CAVI ≥10, and 194 patients had a CAVI ≥9, while 143 patients had a PWV ≥9. Logistic analysis was conducted using each parameter as a discrimination threshold, receiver operating characteristic (ROC) curves were plotted, and areas under the curves were compared. The results showed areas of 0.657 for CAVI ≥10, and 0.663 for CAVI ≥9; and 0.673 for PWV ≥9. When discriminated at CAVI = 9, a value of 0.66 mm served as the boundary for mean IMT.

Conclusions: When using aortosclerosis as an indicator for determining the degree of arteriosclerosis, arteriosclerosis appears to be present for mean IMT > 0.66 mm.

Keywords: CAVI, IMT, arteriosclerosis

O-3-4
Usefulness of carotid B-mode scan as a part of brain checkup (brain dock)

Jun Hasada, Yumi Matsuyama, Kahori Sugimoto
Hatsukaichi Memorial Hospital, Japan

Purpose: The Japan Brain Dock Society states that a carotid B-mode scan should be certified on a brain dock. Therefore, a ca-
rotid B-mode scan should not be categorized as a screening test. Hatsukaichi city has worked on a simple brain dock since 1995, as aid services for national health insurance. In this research, we would like to discuss the needs and problems of a carotid B-mode scan.

Methods: The results were collected from 2009 to 2012 Hatsukaichi brain dock.

Results: The total number conducted is 508 and 208 of them were pointed out that there were some problems in a cervical carotid artery. 58 of them were conducted a carotid B-mode scan, 43 of them had plaques which were more than 1.1 mm in thickness. In addition, we found out one 51.1% and one 64.3% as a NASCET stenosis.

Conclusions: We have a general situation where MRA does not find out any problems but a carotid B-mode scan does. Therefore, in the detection of abnormalities to be treated, a possibility that not be detected by MRA much lower than a carotid B-mode scan. We believe that only a screening test is enough for detecting any problems. We should not spend a lot of time and care on the carotid B-mode scan.

Keywords: carotid B-mode scan, brain dock

O-3-5

Relationship between carotid artery diameter and aortic aneurysms

Yohei Asakawa1, Yasuhisa Daimon1, Hidehiro Takekawa1, Madoka Okamura1, Masanari Yamamoto1, Ryuta Okabe1, Yuko Ishii1, Etsuo Takada2, Koichi Hirata3

1Stroke Division, Department of Neurology, Dokkyo Medical University, Tochigi, Japan, 2Center of Medical Ultrasonics, 3Department of Neurology

Purpose: Dilatation of common carotid artery (CCA) has been indicated as an independent risk factor for thoracic and abdominal aortic aneurysm (AA); however, it has not been yet established in Japanese patients with AA.

Methods: We evaluated 40 AA patients and 40 controls. External and internal diameters of bilateral CCA during diastolic phase were measured in each group. Mann-Whitney U test was used to compare differences between two groups, and receiver operating characteristic curve (ROC) was used to evaluate optimal sensitivity and specificity for diagnosing the co-morbidity of AA.

Results: There were no significant differences in background characteristics of the two groups. With regard to findings of ultrasonography, all diameters were significantly larger in group AA than control group. Based on ROC, the area under curve of the right side external diameter, right side internal diameter, left side external diameter and left side internal diameter were 0.702, 0.675, 0.667 and 0.668, respectively. The sensitivity and specificity of right side external diameter using a cutoff level of 9.4mm were 42.9% and 90.5%, respectively and using a cutoff level of 8.6mm were 64.3% and 64.3%, respectively.

Conclusions: This finding suggests that the increased right side external diameter of CCA during the diastolic phase is associated with AA co-morbidity.

Keywords: common carotid artery diameter, aortic aneurysm, carotid ultrasonography

O-3-6

Association between progress prediction of intracranial artery stenosis and extracranial carotid arteriosclerosis

Heisuke Mizukami, Takahiro Shimizu, Yasuhiro Hasegawa
Department of Internal Medicine, Division of Neurology, St. Marianna University school of Medicine, Tokyo, Japan

Intracranial atherosclerosis is a high-risk cause of ischemic stroke, however, the treatment strategies have not yet been established. Magnetic resonance angiography (MRA) can be used to evaluate the progression or regression of intracranial major artery stenosis (ICMAS). The aim of this study was to identify the association between duplex carotid ultrasound (US) findings and ICMAS progression. A total of 58 patients, mean age of 72.4 ± 10.5 years old, were retrospectively studied. Both MRA and carotid US were repeated after 2 ± 0.8 years in all patients. The extent of stenosis of three arteries, i.e., both middle cerebral arteries and the basilar artery, in each patient was classified into five grades based on GSS. ICMAS progression was defined as worsening of stenosis by one or more grades on final MRA. Logistic regression analysis revealed that baseline GSS ≥ 1 point and area stenosis ≥ 70% in carotid US were significantly associated with ICMAS progression. In addition, annual increase of maxIMT > 0.15mm was significantly associated with ICMAS progression. Extracranial atherosclerosis evaluated by carotid US is associated with ICMAS progression. When the ICMAS progression in MRA is used as a surrogate marker for the effects of medical intervention, these factors should be considered.

Keywords: Atherosclerosis, Carotid ultrasound, Magnetic resonance imaging
O-3-7
Clinical significance of reverse flow in the intracranial vertebral artery evaluated by transcranial color flow imaging

Hidetaka Mitsumura, Ayumi Arai, Masayuki Sasaki, Kenichi Sakuta, Yasuyuki Iguchi
1Department of Neurology, The Jikei University School of Medicine, Tokyo, Japan, 2Department of Diagnostic Radiology, The Jikei University School of Medicine, Tokyo, Japan

Purpose: Transcranial color flow imaging (TC-CFI) can evaluate flow direction of intracranial arteries real-timely. Our purpose is to reveal the clinical significance of reverse flow in the intracranial vertebral artery (VA) evaluated TC-CFI by suboccipital approach.

Methods: Subjects is the consecutive patients with TC-CFI and carotid ultrasonography who can be evaluated intracranial VA by TC-CFI. We analyze the relationship between reverse flow of intracranial VA and diagnosis of vessel lesion.

Results: Eight hundred sixty nine patients were registered. In these subjects, reverse flow in the intracranial VA was seen for 1.7% (15 patients, 13 men, median age 65 years old). Twelve patients were acute ischemic stroke. Among 8 patients with ischemia of vertebral-basilar territory who had occlusion of distal VA by carotid ultrasonography in all cases, six patients (75%) were dissection of intracranial VA because pearl and string sign or pseudo lumen were seen in magnetic resonance angiography or CT angiography.

Conclusions: Although it was difficult to evaluate the hemodynamics of distal VA occlusion using carotid ultrasonography, TC-CFI was useful for assessment of intracranial VA. The reverse flow of intracranial VA using TC-CFI was seen frequently in the patients with dissection of intracranial VA.

Keywords: reverse flow of intracranial VA, TC-CFI, VA dissection

Oral Presentations
Session4: Intraoperative ultrasound

O-4-1
Safety and efficacy of the ultrasonic cutting device during carotid endarterectomy

Koijiro Wada, Kentaro Mori, Naoki Ootani, Hideo Osada, Satoshi Tomura, Satoru Takeuchi, Kimihiro Nagatani

Department of Neurosurgery, National Defense Medical College, Saitama, Japan

Objective: An ultrasonic cutting device (harmonic scalpel, Johnson & Johnson Co., Ltd.) is commonly used in cardiovascular surgery for harvesting the donor vessel. Here we report our experience of using the harmonic scalpel for CEA.

Material and methods: We performed 28 consecutive CEA procedures in patients (27 males, one female, average age 72 years) using the harmonic scalpel from April 2011. Eighteen cases were high position. Complications in these cases were compared to 28 consecutive cases without harmonic scalpel performed previous to April 2011.

Results: One patient (4%) suffered ischemic complication (no significant difference). No patient died (no significant difference). Five patients (18%) had postoperative high intensity signal increase on diffusion-weighted magnetic resonance imaging (no significant difference). Three patients suffered transient hoarseness, including recurrent nerve paralysis in one patient (no significant difference). Transient hoarseness in 3 of the 18 cases of high position stenosis performed with the harmonic scalpel showed significant decrease compared with the 6 of 11 cases treated without the harmonic scalpel (P<0.05).

Discussion: The harmonic scalpel is reported to cause less heat injury to the vessel compare to electric cautery, which may have contributed to reduced complications with the superior laryngeal nerve.

Keywords: Carotid endarterectomy, Harmonic scalpel, hoarseness

O-4-2
Final check for safety carotid endarterectomy using intraoperative ultrasound, A case report

Kiyoshi Kumano, Shinji Okita, Hitoshi Kawamoto, Naomi Hashimoto, Akihiro Toyota, Kanji Yamane
1Department of Neurosurgery, Chugoku Rosai Hospital, Hiroshima, 2Eisei clinic, Shimane

We have routinely carried out ultrasound during carotid endarterectomy (CEA) since 2006. A small–sized probe(linear type, 7-15MHz, about 3cm in length) is used.

A 77-year-old man was admitted because of left internal carotid artery stenosis with no symptom. In the CEA, after closure of the arteriotomy, ultrasound show the intimal flap in the internal carotid. Repair at the margin of the endarterectomy in internal carotid was done. The patient developed no neurologic defi-
O-4-3  
A surgical technique of microvascular Doppler assisted neuroendoscopic third ventriculostomy

Seiichiro Eguchi, Yasuo Aihara, Yoshihiro Omura, Shunsuke Tsuzuki, Yoshikazu Okada  
Department of Neurosurgery, Tokyo Women’s Medical University, Japan

**Purpose:** Endoscopic third ventriculostomy (ETV) has a great impact on the treatment of hydrocephalus. It is an epoch making approach but even now it remains at risk for damaging the basilar artery (BA), posterior cerebral arteries (PCAs) and their perforators. Then we try to detect the vessels through the tuber cinereum (TC) by using the pulse-waved microvascular Doppler probe. Here the availability and effectiveness of this novel method are reported.

**Material and Methods:** The neuroendoscope is a flexible videoscope, VISERA ventricular videoscope OLYMPUS VEF TYPE V (OLYMPUS medical systems, Co., Tokyo, Japan) and the microvascular Doppler sonometer is an ultrasonic pulse-waved Doppler system, Companion III (CareFusion Co., California, USA). In the ETV surgery, the neuroendoscope storing the microvascular Doppler probe in its working channel was guided to the third ventricle floor before perforation. The BA and PCAs were detected through the TC and then ETV was performed with probe head.

**Results:** In some cases, the vessels could not be identifiable but even if undetectable before ETV, they were confirmed during perforation.

**Conclusions:** The microvascular Doppler is most efficient for detecting accurate localization of the BA complex and results are great help which are free from previous dangers associated with ETV.

**Keywords:** Endoscopic third ventriculostomy (ETV), pulse-waved microvascular Doppler, intraoperative hemorrhagic complication

---

O-4-4  
The perioperative sonographic study on the patients with brain tumor

Tsutomu Nakaoka

The department of Neurosurgery, Hoya Kosei Hospital, Tokyo, Japan

**Purpose:** The usefulness of Ultrasound sonography (US) for brain tumor

**Methods:** The 38 cases were objects. The instrument is HDI5000 and iE-33 (Philips), linear probe (L12-5) and sector probes (P4-2, X3-1). The modalities were B-mode and Color Flow Mapping (CFM), Pulse Inversion Harmonic imaging (PIHI) with contrast agents (IClp), 3D image by volume imaging method (VI). The impedance calculation and analysis of the preprocessing data by QLA. Furthermore time intensity curves (TIC) and Color coded Imaging (CCI) were made. <Case > she admitted our hospital complaining left hemiparesis. The right frontal tumor was revealed by MRI and CT. The intraoperative B-mode findings were the hemorrhage and microcirculation in tumor, tumor and edema. Furthermore we’re referred CFM and IClp to identify the tumor. We were able to calculate the tumor size and volume by VI method. The findings helped us to remove the tumor. The pathological diagnosis was Glioblastoma multiforme (GBM). Her post-operative course was not eventful after two years.

**Conclusions:** There’re the intraoperative MRI rooms in some hospitals, but we suggest being able to substitute US for MRI. The IClp, CCPI, TIC were possible to assess the functional disturbances and pathological states. The real time 3D images from the VI method provide us the dynamic changing of B-mode, CFM, IClp and CCPI of tumor.

**Keywords:** brain tumor, Ultrasound sonography, contrast agents

---

O-4-5  
The intraoperative sonographic findings of cerebral aneurysm

Tsutomu Nakaoka

The department of Neurosurgery, Hoya Kosei Hospital, Tokyo, Japan

**Purpose:** The intraoperative sonographic findings of aneurysm (An)

**Methods:** The 145 cases with An were objective. Ultrasound instruments were HDI5000 and iE-33 (Philips). The modalities...
were B-mode, Color Flow Mapping (CFM) and Pulse Inversion Harmonic imaging (PIHI) with contrast agents (PI), perfusion images (ICIp), microvascular imaging (MVI). Furthermore we tried the analysis of the preprocessing data by QLAB after the examination. The time intensity curves (TIC) and Color coded Imaging (CCI) were made.

**Results:** Some cases were difficult to observe Ans, but the majority of Ans were generally observed. Microparticles in the Ans were regarded as the separation of the endothelium. CFM indicated the blood flow signal changings of An before and after clipping. The spiral of the blood flow signal in aneurysm was observed by the 3D. The volume imaging method (VI) propose the measurement of An and the observation from various directions. The blood flow disturbance can be observed by MVI. There is the possibility of the substitute PI and ICIp for ICG.

The ICIp can observe perfusion, TIC or CCI from the pre-processing data by QLAB provide us the objective assessment of cerebral disturbance.

**Conclusions:** The intraoperative sonographic study of Ans is able to substitute CT and MRI. That will be able to discriminate between organic and functional disturbance by assessing ICIp, TIC and CCI.

**Keywords:** Aneurysm, Ultrasound sonography, B-mode

---

**Oral Presentations**

**Session 5: Cervical arterial dissection**

**O-5-1**

**Serial evaluation of transoral carotid ultrasonography (TOCU) in a patient with bilateral internal carotid artery dissection**

Yuta Hagiwara, Takahiro Shimizu, Atsushi Tsuchiya, Takeshi Imai, Yasuhiro Hasegawa
Department of Internal Medicine, Division of Neurology, St. Marianna University School of Medicine, Kanagawa, Japan

TOCU is a powerful tool for the evaluation of arterial dissection in the far distal segment of the extracranial internal carotid artery (ICA). A 48-year-old man had a sudden onset blurred vision followed by transient speech disturbance. No neurological abnormality was observed except blurry vision. Conventional carotid ultrasound revealed the left ICA occlusion and double lumen was detected by 3D-CT angiography (CTA). A thrombosed pseudolumen was visualized by TOCU in the far distal segment of ICA. We diagnosed ICA dissection and started anticoagulation. However, he suffered transient aphasia on Day-3 and acute ischemic lesion in the left insular cortex was revealed by MRI. On Day-16, blood flow signal was detected by TOCU in the true lumen but not in the thrombosed pseudolumen. On Day-23, he was discharged from hospital under the antiplatelet monotherapy. At the scheduled follow-up of CTA and TOCU examination on Day-36, we detected an asymptomatic new arterial dissection in the right ICA. We confirmed new dissection by conventional angiography. On Day-58, he was discharged without further ischemic events. This case demonstrated that asymptomatic contralateral ICA dissection may developed within a short period of time and serial examination of TOCU is highly useful in such case.

**Keywords:** transoral carotid ultrasonography, bilateral ICA dissection

**O-5-2**

**Bilateral internal carotid artery dissection in Behcet’s disease patient; A case report**

Tomoya Mukai, Naohisa Hosomi, Akiko Segawa, Naoto Kinoshita, Juri Kitamura, Shiro Aoki, Hiroki Ueno, Kazuhide Ochi, Takemori Yamawaki, Masayasu Matsumoto
Department of Neurology, Hiroshima University Hospital, Hiroshima, JAPAN

We report a rare case of bilateral internal carotid artery dissection occurred in Behcet’s disease (BD) patient. Case: A 49-year-old man was admitted to our department because of headache and visual impairment. He had a long history of BD with repeated oral ulcer and flank pain. Two years before his admission, ileocecal ulcer was revealed with colonoscopy. Ocular manifestation such as chorioretinitis was also observed. Based on the International Criteria for Behcet’s Disease, the diagnosis was confirmed. He had no other symptom. Carotid ultrasonography revealed that he had flap and reverse flow in the bilateral internal carotid artery. MRI demonstrated no fresh infarct in the brain. He was prescribed aspirin for the prevention of stroke. Two weeks later, the flap disappeared and normal flow was observed. We diagnosed bilateral internal carotid dissection. BD is known as an uncommon cause of stroke. BD’s vascular manifestation is known as superficial phlebitis, deep vein thrombosis, large vein thrombosis, arterial thrombosis and aneurysm. Venous thrombosis is the major vascular disorder represent in 7-33% of BD patients and 85-93% of vasculo-BD patients. Arterial disorder is rarely reported.
Conclusions: We reported a rare case of BD patient presenting bilateral internal carotid artery dissection detected by ultrasonography.

Keywords: Behcet’s disease, internal carotid artery, bilateral dissection

O-5-3
Three idiopathic internal carotid artery dissections with various clinical states and morphology changes

BooHan Hyun, Keiko Nagano, Yoko Kimura, Masafumi Tagaya, Hideki Etani
National Hospital Organization Osaka National Hospital, Osaka, Japan, Department of cerebrovascular disease

Case1. A 34-year-old man presented with the left-side loss of vision, and was diagnosed as the left retinal artery occlusion. The carotid ultrasonography showed that the left internal carotid artery (ICA) is occlusive from the origin and has a mobile flap, and Magnetic Resonance Angiography (MRA) showed the partial thrombosis in it. The retinal artery was re-canalized and the symptom disappeared gradually. The carotid ultrasonography after 6 weeks showed that the mobile flap disappeared and the false lumen was occluded by thrombosis.

Case2. A 47-year-old woman with a tension headache and hypertension was seen because of the blurred vision. The carotid MRA showed the dilatation of left-internal carotid artery and the flap in the lumen, and the carotid ultrasonography showed the false lumen with the flap and stenosis. The lesion has had no changes for 4 years.

Case3. A 44-year-old man with haemophilia A, HIV-infection, and on dialysis was presented because the carotid ultrasonography showed the tumor-like shadow next to the left internal carotid artery. It was diagnosed as the thrombosis within the wall of vessels.

As idiopathic internal carotid artery dissections vary with time, we should exam them with not only MRI but carotid ultrasonography.

Keywords: Carotid artery dissection, Mobile plaque, thrombosis

O-5-4
Ultrasonographic findings of five patients with extracranial vertebral artery dissection

Noriko Fukuzumi1, Hirotoshi Hamaguchi2, Hitomi Kousaka1, Tsumugi Oki1, Masako Sakamoto1, Takamitsu Imanishi1, Nobuhide Hayashi1, Seiji Kawano1, Fumio Kanda2
1Department of Clinical Laboratory, Kobe University Hospital, 2Department of Neurology, Kobe University Hospital

Purpose: Vertebral artery dissection is an established cause of ischemic stroke in the vertebrobasilar circulation territory of young adults who have no risk factors for atherosclerotic arterial disease. In this study, we examined the characteristic findings of extracranial vertebral artery dissection using ultrasonography.

Subjects: Abnormalities in six vertebral arteries of five patients (3 females, 2 males; mean age, 43.8 ± 22.1 years) were followed up using ultrasonography at 1, 2, 3, 6 and 12 months.

Results: Typical ultrasonographic findings comprised localized dilation, intramural hematoma, spiral flow, double lumen and false lumen flow. At follow-up, we found reduced diameter, improved hematoma, and lumen dilation, as well as altered echogenicity. The abnormal findings in four young patients improved around two months later and normalized around six months later; however, the findings did not change in one older patient.

Conclusions: Duplex color flow imaging helped to diagnose extracranial vertebral artery dissection and was thus useful as a follow-up methodology.

Keywords: Extracranial vertebral artery dissection, Ultrasonographic findings, Follow-up

Oral Presentations

Session 6: Aortic lesion

O-6-2
Factors associated with aortic arch atherosclerosis assessed by real-time three-dimensional transesophageal echocardiography in acute ischemic stroke

Keisuke Tokunaga1, Masatoshi Koga2, Satoshi Ohyama1, Koji Tanaka1, Kazuaki Sato1, Rieko Suzuki1, Kazunori Toyoda1
1Department of Cerebrovascular Medicine, 2Division of Stroke Care Unit, National Cerebral and Cardiovascular Center, Suita, Japan

Purpose: The purpose of this study was to determine factors associated with aortic arch atherosclerosis assessed by three dimensional (3D) transesophageal echocardiography (TEE) in acute ischemic stroke.
Methods: Acute ischemic stroke patients who were admitted within 7 days after onset and underwent 3D TEE were included. According to the histopathological classification of atherosclerosis defined by the American Heart Association (AHA), we classified aortic arch atherosclerosis on 3D TEE into mild, moderate, calcification, and severe groups, and then compared their background and stroke subtypes.

Results: Of the 120 patients enrolled, 16 were classified into mild group, 22 into moderate group, 53 into calcification group, and 29 into severe group. Ordinary logistic analysis revealed that advanced age, male gender, dyslipidemia, and undetermined etiology were independent factors associated with aortic arch atherosclerosis.

Conclusions: Advanced age, male gender, dyslipidemia, and undetermined etiology were independent factors associated with severity of aortic arch atherosclerosis assessed by 3D TEE in acute ischemic stroke.

Keywords: 3D TEE, aortic arch atherosclerosis, ischemic stroke

O-6-3
3 cases of aortic genotype stroke treated with acute recanalization therapy

Ayako Kuriki¹, Hirotaka Katou¹, Hidetomo Murakami¹, Masayuki Sugie², Satoshi Yano¹, Daigo Hayashi¹, Toshihisa Sugita¹, Keita Mizuma¹, Yuki Kamiya¹, Misuru Kawamura¹
¹Department of Neurology, Showa University, Tokyo, Japan, ²Department of Neurology, Showa University Fujigaoka Hospital, Kanagawa, Japan

Background and purpose: We describe 3 cases of aortogenic stroke treated with acute recanalization therapy. Case 1: 78-year-old man who had left hemiparalysis. NIHSS score on admission was 7. MRI showed no abnormality. The symptom was no change after rt-PA. MRI at 6th day demonstrated infarcts of right ACA area. Transesophageal echocardiography (TEE) showed mobile aortic plaque. The Modified Rankin Scale (mRS) at discharge was Grade 2.

Conclusions: It is supposed that rt-PA is not effective for aortogenic embolism which is a platelet thrombus. In our case that tried combination therapy of rt-PA and endovascular therapy, the complications of catheter were not caused and the case had a good outcome. We consider it appropriate to try combination therapy to aortogenic embolism.

Keywords: ischemic stroke, aortogenic embolism, acute recanalization therapy

O-6-4
Efficacy of Poststroke Intensive Rosuvastatin Treatment for Aortic Embolic Stroke (EPISTEME trial): pilot study

Yuji Ueno¹, Masao Watanabe¹, Yasutaka Tanaka¹, Hideki Shimura¹, Nobutaka Hattori², Takao Urabe³
¹Department of Neurology, Juntendo University Urayasu Hospital, ²Department of Neurology, Juntendo University School of Medicine, Japan

Purpose: Rosuvastatin is a potent lipid-lowering agent and repress carotid and coronary artery atherosclerosis. It is unclear that rosuvastatin has anti-atherogenic effect for AAPs in stroke patients. We performed repeated transesophageal echocardiography (TEE) examinations and analyzed the changes of AAPs after rosuvastatin treatment in stroke patients.

Methods: Ischemic stroke patients with AAPs > 4mm demonstrated on TEE were randomly assigned to two groups: (1) treatment with rosuvastatin at a dose of 5 mg/day; (2) control. We assessed morphological changes of AAPs and lipid profile with or without rosuvastatin therapy after 6 month.

Results: 9 patients (age, 68 ± 8 years; 9 male) with ischemic stroke were undergoing repeated TEE and laboratory examination. The rosuvastatin-treated and control group had 5 and 4 patients, and 10 and 9 AAPs lesions, respectively. The rosuvastatin-treated group significantly decreased low-density lipoprotein-cholesterol (LDL-C, -39% vs 10%, P<0.01), and non-high-density lipoprotein-cholesterol (non-HDL-C, -36% vs 2%, P<0.05) compared to the control group. In follow-up TEE, rosuvastatin significantly increased high-echoic plaque area, whereas the control group showed decrease in high-echoic plaques area (77% vs -23%, P<0.001).

Conclusions: Rosuvastatin improved lipid profiles, and stabilized AAPs. Current data could contribute to the evidence of therapeutic strategy for aortogenic brain embolism.

Keywords: Atheromatous aortic plaques, rosuvastatin, lipid pro-
O-6-5
Perfusion imaging of white matter lesion by using continuous arterial spin-labeling imaging : Comparison with carotid ultrasonography

Osamu Yamamura, Soichi Enomoto, Tomoko Kamisawa, Toru Kishitani, Norimichi Shirafuji, Tomoko Muramatsu, Akiko Matsunaga, Masamichi Ikawa, Tadanori Hamano, Hirohiko Kimura*
Department of Neurology, Faculty of Medical Science, University of Fukui, *Department of Radiology, Faculty of Medical Science, University of Fukui, Japan

Purpose: The goal of the present study was to expect the influence of continuous arterial spin labeling (CASL) imaging for grading of periventricular hyperintensity (PVH) by MRI and to compare these results with carotid ultrasonography.

Methods: We examined thirty patients (aged 71.3 ± 11.7 years) using with CASL imaging. All the patients had severe stenosis or occlusion in internal cerebral artery or middle cerebral artery (MCA). PVH was classified based on the guideline of Japan Brain Dock Society. By the CASL imaging, case which has 2/3 or more hypoperfusion area to MCA domain was defined as the deficit group. We compared end diastolic velocity (EDV) of the common carotid artery between the deficit group and the non-deficit group.

Results: Deficit group were five cases of the right side and eight cases of the left side. In the right side, EDV of deficit group was significantly low as compared with non-deficit group (p<0.01). In the left side, EDV of deficit group was significantly low as compared with non-deficit group (p<0.05). There was no relation between the deficit group and the grade of PVH.

Conclusions: In this study, the severe hypoperfusion of the cerebral hemisphere did not participate in the grade of PVH.

Keywords: arterial spin labeling, end diastolic velocity, periventricular hyperintensity

O-7-1
The effect of physical characteristics on reference nerve sizes along the median and ulnar nerves and the cervical nerve roots in healthy adults

Takamichi Sugimoto1, Kazuhide Ochi1, Naohisa Hosomi1, Tomoya Mukai1, Hiroki Ueno1, Takeshi Nakamura1, Tetsuya Takahashi1, Toshiho Ohutsuki1, Tatsuo Kohriyama2, Masayasu Matsumoto1
1Department of Neurology, Hiroshima University Hospital, Hiroshima, Japan, 2Department of Neurology, Hiroshima City Hospital, Hiroshima, Japan

Objective: The objective of this study was to identify ultrasonographic reference values of nerve sizes along the peripheral nerves and among the cervical nerve roots. We found associations between reference nerve sizes and several physical characteristics (gender, dominant hand, age, height, weight, body mass index[BMI] and wrist circumference), and verified reliable sites and site-based differences between reference values.

Methods: Nerve sizes were measured at 26 sites/levels in 60 healthy Japanese adults (29 males, age 35.4 ± 9.7 years, BMI 22.3 ± 3.6 kg/m² and wrist circumference 16.0 ± 1.3 cm on the right side and 15.9 ± 1.2 cm on the left side).

Results: Mean reference nerve sizes were 5.6-9.1 mm² along the median nerve, 4.1-6.7 mm² along the ulnar nerve and 2.14-3.39 mm among the cervical nerve roots. Multifactorial regression analyses showed that the physical characteristics most strongly associated with nerve size were age, BMI and wrist circumference at the entrapment sites, as well as wrist circumference and gender at the nonentrapment sites. Site-based differences in nerve size were determined (p<0.001).

Discussion: Factors with the greatest influence on nerve size differed between the entrapment and nonentrapment sites. Actually, wrist circumference was strongly associated with gender in our study (correlation coefficient of -0.8, p<0.001), reference nerve sizes by gender and by site may prove useful for simple assessments.

Keywords: Peripheral nerves; Cervical nerve roots; Reliability

O-7-2
Usefulness of Neurosonology for Diagnosing Peripheral Neu-
A demyelination.

Objective: We report the usefulness of ultrasonography in diagnosing Lewis–Sumner syndrome (LSS) and chronic inflammatory demyelinating polyradiculoneuropathy (CIDP).

Case 1: A 47-year-old male had weakness of the finger extension and numbness in the fingers. Nerve conduction study suggested axonal polyneuropathy with mild focal conduction slowing at the cubital tunnel. Peripheral nerve ultrasound revealed median nerve edema in the right upper arm and ulnar nerve edema from elbow to the upper arm bilaterally, which indicated a demyelination.

Case 2: A 64-year-old female complained of foot numbness and gait disturbance. Electrophysiological testing revealed a remarkably prolonged F-wave latencies in the bilateral tibial nerves. Lower extremity somatosensory evoked potentials (P40) were also prolonged. The sural sensory study showed reduced amplitudes bilaterally. Magnetic resonance imaging (MRI) of the cervical spine was normal. The ultrasound study showed edema of the median and ulnar nerves at the elbow bilaterally, hypertrophy of the tibial nerves at the popliteal fossa bilaterally, and hypertrophy of the right C6 root. These results suggested the presence of a demyelinating lesion, which led to the diagnosis of CIDP.

Conclusions: The combined use of electrophysiology and ultrasound could improve diagnostic precision of demyelinating polyneuropathy.

Keywords: CIDP, LSS, Demyelinating Polyneuropathy.

O-7-4
Ultrasonography of muscles is useful for diagnosis of drop-head syndrome due to isolated myositis of neck extensor: a case report

Mayuko Izumi1, Masatoshi Takahashi1, Naoko Takamatu2, Kaori Tai1, Kanako Ichimaru1, Shinichi Matsumoto2
1Department of Neurology Shinko Hospital, Department of Neurology Tokushima University, 2Department of Laboratory Shinko Hospital, Japan

79-year-old man with diabetes mellitus. 3 months before admission, falling neck to worsening fatigue was found, and developed gradually. At the same time, squamous cell carcinoma of the right lung pointed out and was resected, but neck drop sustained since then. Isolated muscle weakness in neck extensor was found, but without looking at the muscle atrophy and muscle pain. Other Neurological findings were normal. Laboratory examination demonstrated mild inflammation without CK elevation, or autoantibodies such as AchR or Musk antibody. Repetitive EMG was normal finding in spite of slightly improvement in edrophonium test. Needle EMG revealed early recruitment with fibrillation potential in only deep neck extensor muscles. Ultrasonography of muscles could reveal abnormalities localized to these muscles, distinguishable clearly from trapezius. The abnormalities characterized coarse and high echogenicity, and swelling of muscles. Enhanced MRI and PET / CT demonstrat-
ed abnormality in these muscles, and diagnosed with isolated myositis of neck extensor result of muscle biopsy. To use ultrasoundography of muscles, we could identify isolated myositis more clearly and better sensitivity than MRI, and search non-invasive and comprehensive unlike the needle EMG. Ultrasoundography of muscles was considered useful in the diagnosis of myositis.

**Keywords:** Ultrasoundography of muscles, drop-head syndrome, isolated myositis of neck extensor

---

**O-7-5**

**A semi-quantified evaluation of substantia nigra hyperechogenicity in Parkinson’s disease and Parkinsonian syndrome**

Ayaka Numao¹, Keisuke Suzuki¹, Hidehiro Takekawa², Masayuki Miyamoto¹, Tomoyuki Miyamoto¹, Masaoki Iwanami³, Etsuo Takada⁴, Koichi Hirata¹

¹Department of Neurology, Dokkyo Medical University, Tochigi, Japan,
²Stroke Division, Department of Neurology, Dokkyo Medical University, Tochigi, Japan,
³Department of Neurology, Dokkyo Medical University Koshigaya Hospital, Saitama, Japan,
⁴Center of Medical Ultrasonics, Dokkyo Medical University, Tochigi, Japan

**Objective:** To quantify substantia nigra (SN) hyperechogenicity in patients with Parkinson’s disease (PD) and Parkinsonian syndrome (PS), we applied semi-quantified evaluation method.

**Patients and Methods:** Hospitalized patients with PD (n=28) and patients with Parkinsonian syndrome (PS) (n=17) and inhospital controls (n=10) were included. The PS group consisted of patients with progressive supranuclear palsy (n=7) and multiple system atrophy (n=10). TCS was performed using a conventional transcranial Doppler sonography equipped with 2.5 MHz transducer. The SN was identified within midbrain, and then the area of echogenic signals was encircled and measured according to Berg et al. Next, echogenic signal of SN and dorsal midbrain were converted into grayscale using Adobe Photoshop and a median value of SN and dorsal midbrain on histogram was obtained. The SN to dorsal midbrain ratio was calculated.

**Results:** The PD group (4.1 ± 3.7) showed increased SN to dorsal midbrain ratio compared with that in PS group (1.7 ± 0.9) and controls (1.8 ± 1.1). The area of SN hyperechogenicity was larger in PD group (0.19 ± 0.11 cm²) than in PS group (0.07 ± 0.07 cm²) and controls (0.05 ± 0.07 cm²).

**Conclusions:** Semi-quantified evaluation of SN echogenicity using SN to dorsal midbrain ratio may be useful in differential diagnosis of PD from PS.

**Keywords:** substantia nigra hyperechogenicity, Parkinson’s disease, Parkinsonian syndrome

---

**O-7-6**

**Investigation of tongue sonography, tongue pressure, and videofluoroscopic examination in patients with dysphagia**

Masahiro Nakamori¹,², Yuishin Izumi³, Sachiko Takaki³, Masanori Hijii³, Masaya Oda³, Hijiir Itou³, Tetsuya Takahashi¹, Naohisa Hosomi¹, Hirofumi Maruyama¹, Masayasu Matsumoto¹

¹Department of Clinical Neuroscience and Therapeutics, Hiroshima University Graduate School of Biomedical and Health Sciences, Hiroshima, Japan,
²Mifukai Viha-ra Hananosato Hospital, Miyoshi, Hiroshima, Japan

**Background:** Tongue sonography and tongue pressure testing are simple and objective, and the risks associated with these techniques are very low. They are useful methods for evaluating patients with dysphagia. Moreover, tongue sonography is a useful tool for establishing diagnoses such as amyotrophic lateral sclerosis (ALS).

**Methods:** We investigated 12 patients with ALS who underwent tongue sonography, tongue pressure testing, and videofluoroscopic examination. Tongue sonography was used to measure the tongue thickness. The measurement points were determined on the upper and lower surfaces of the lingual muscles in the center of the plane perpendicular to the Frankfurt horizontal plane in a frontal section. This perpendicular plane went through the distal surfaces of the bilateral mandibular second premolars. The vertical distance was measured from the surface of the mylohyoid muscle to the tongue dorsum.

**Results:** Tongue thickness and tongue pressure were correlated, which suggested extension of the time in the oral phase. Conversely, the time in the pharyngeal phase was normal, even among patients with progressed ALS.

**Conclusions:** In patients with ALS, reductions in tongue thickness and pressure lead to dysfunction of the tongue, sending food to the pharynx. Tongue sonography is useful for repeated quantitative, low-risk evaluation.

**Keywords:** tongue sonography, tongue pressure, dysphagia

---

**O-7-7**

**Sonographic findings and evaluation of the larynx and the neighboring structures**

---

**Keywords:** substantia nigra hyperechogenicity, Parkinson’s disease, Parkinsonian syndrome
Tsutomu Nakaoka
The department of Neurosurgery, Hoya Kosei Hospital, Tokyo, Japan

**Purpose:** The sonographic findings of the around larynx and swallowing movement

**Methods:** The cases contained 10 cases with normal and the 43 cases with dysphagia by CVD. The instrument was HDI5000, linear probe (L12-5). The sagittal section is that the probe set up 1 cm outside from midline and the horizontal section is between calitago thyroidea (CT) and calitago cricoidea. Furthermore we tried the contrast sonographic swallowing test (CSST).

**Results and discussion:** The Videofluorography (VF) and Videoendoscopy (VE) are valued, though they observe only the interior from mouth to esophagus. That is one-side, so we need the swallowing assessment of the outside structures. We pay attention to the movement of OH and CT at swallowing, they’re the simultaneous movement on the normal, but there’re the saccadic movements, no simultaneous movements and the abnormal positions on the patients with dysphagia. The left and right plate of CT close at swallowing that the food is prevented to enter the larynx. On the patients with dysphagia, the close of plates was inadequate. Furthermore CSST was observed contrast agent appearances before swallowing and remnants on the patients with dysphagia.

**Conclusions:** US are useful as the dysphasia examination. US provide us some new outside role data. There’re many new findings between US and VE, VF.

**Keywords:** Ultrasound sonography, larynx, dysphagia

---

**O-7-8**

Psychiatric Symptom Improvement by Ultrasonic Diagnosis and “Double-cross” Intramuscular Injection Technique: a Case Report of Patient with Chronic Schizophrenia

Yuueren Zhao¹, Sakiko Sakamaki², Yuko Yasuhara³, Tetsuya Tanioka³, Kazushi Motoki³, Kensaku Takase³

¹Department of Psychiatry, Okehazama Hospital Fujita Kokoro Care Center, ²Department of Nursing, Graduate School of Health Science, The University of Tokushima, ³Department of Nursing Management, Institute of Health Biosciences, The University of Tokushima, ⁴Department of Inspection Technology, Tokushima Prefectural Kaifu Hospital, ⁵Department of Neurosurgery, Tokushima Prefectural Central Hospital, Japan

Preventive effect of long-acting injectable antipsychotics (LAI) for patients with schizophrenia has been clarified. However, when oil-based LAI is injected into subcutaneous tissue, injection site reaction often occurs. The Purpose of this study is to report the improved psychiatric symptoms of chronic patients with schizophrenia who received an improved long acting intramuscular injection procedure. Case was a female patient with schizophrenia in her 40s and has been treated with fluphenazine decanoate 50 mg every other week for six years. In year X, she was hospitalized with worsening psychological symptoms and induration was recognized by palpation. Ultrasonic diagnostics confirmed low density area to induration of gluteus maximus muscle. Therefore, injection site was changed from “four- and three-way split” to “double-cross” method and injection depth was made deeper by injection needle being changed to a longer one, 20G (38 mm). As a result, no induration was formed, her psychological symptom was improved and she was discharged from hospital two month later. Length of injection needles, which is 2/3-1/2 (19.0-25.3 mm) of 21G (38 mm) will reach gluteus medius muscle. From viewpoints of prevention of injection site reaction and stability of psychiatric symptoms, selections of injection needle and injection depth are very important.

**Keywords:** long-acting injectable antipsychotics, injection needle and injection depth, injection site reaction and stability of psychiatric symptoms

---

**O-8-1**

Continuous monitoring of cerebral autoregulation in the vertebrobasilar artery evaluated by transcranial color duplex sonography

Toshiyuki Shiogai¹, Mayumi Yamamoto¹, Yuka Arima¹, Daichi Yamasaka³, Kei Inoue³, Kenji Yoshikawa³, Toshiki Mizuno³, Masanori Nakagawa³

Departments of ¹Clinical Neurosciences and ³Radiology, Kyoto Takeda Hospital, ²Department of Stroke Medicine, Hoshigaoka Kouseinenkin Hospital, ³Department of Neurology, Kyoto Prefectural University of Medicine, Japan

**Objective:** To clarify the significance of continuous monitoring in the vertebrobasilar artery (VBA) autoregulation, vertebrobasilar hemodynamics during postural changes were evaluated by transcranial color duplex sonography (TCDS).

**Methods:** Subjects were five controls and seven patients. TCDS
utilizing the transducer holder Sonopod was monitored continuously in the intracranial VA or BA. Blood pressure (BP), heart and respiration rates were also monitored. During two series of postural changes (supine or sitting to/from standing), a) clinical symptoms, b) BP: systolic, mean, and diastolic pressures (SBP, MBP, and DBP), c) TCDS: Time-averaged maximum velocity and Pulsatility Index (PI), Estimated Cerebrovascular Resistance (eCVR) = MBP/Vmax, and Autoregulation Index (ARI) = (eCVR/MBP) were evaluated.

**Results:** a) Dizziness resulted in an inability to remain standing in two patients; lacunar infarction (LI) with diabetes mellitus and spino-cerebellar degeneration (SCD). b) BP: 1) DBP>10mmHg in all cases. 2) SBP>20mmHg in 3 controls and all but one patient (LI). 3) Hypotension during standing only in 1 SCD patient. c) TCDS: Tendencies of decreased eCVR/ARI and increased PI were observed in all patients.

**Conclusions:** Continuous TCDS monitoring in the VBA during postural changes is capable of evaluating pathophysiology of verteobasilar autoregulation and is useful for diagnosis and treatment of autonomic dysregulation.

**Keywords:** Transcranial Color Duplex Sonography, verteobasilar autoregulation, postural changes

---

**O-8-2**

**Ultrasonic Doppler diagnosis of stenotic lesions in the intracranial vertebral and basilar arteries**

Toshiyuki Shiogai\(^1\), Mayumi Yamamoto\(^1\), Yuka Arima\(^1\), Mari Koyama\(^1\), Masahiro Makino\(^1\), Toshiki Mizuno\(^1\), Masanori Nakagawa\(^1\)

\(^1\)Department of Clinical Neurosciences, Kyoto Takeda Hospital, Kyoto, \(^2\)Department of Neurology, Kyoto Second Red Cross Hospital, Kyoto, \(^3\)Department of Neurology, Kyoto Prefectural University of Medicine, Kyoto, Japan

**Objective:** Doppler diagnosis of intracranial verteobasilar artery (VBA) stenosis has been based on increased time-averaged maximum velocity (Vmax)>50cm/s in the intracranial VA (V4), and >60cm/s or peak systolic velocity (PSV)>120cm/s in the BA. To confirm the reliability of the Doppler diagnosis, we compared color duplex sonography (CDS) with MR angiography (MRA).

**Methods:** Based on MRA, 111 consecutive patients (ages 44-96, mean 74) were classified into three groups: no stenotic lesions (NC) (n=42), anterior circulation stenotic lesions (ACS) (n=26), and abnormal (occlusive and/or hypoplastic) VA lesions (VAA) (n=43). Vmax in the cervical VA (V2), V4, and BA, and BA PSV were evaluated.

**Results:** a) NC: Two V4 Vmax>50 cases were identified. b) ACS: Two occlusive cases in the cervical internal carotid and middle cerebral arteries showed V4 Vmax>50, BA Vmax>60, and BA PSV>120. c) VAA: Seven V4 Vmax>50 (1 BA Vmax>60) cases were observed. d) There were no V2 Vmax<20 cases.

**Conclusions:** 1) Increased velocity in the intracranial VBA is caused by collateral hemodynamic changes due to occlusive lesions in the anterior circulation or a contralateral VA hypoplasia. 2) In CDS diagnosis of intracranial VBA stenosis, evaluations of both cervical and intracranial arteries in the anterior and posterior circulation are necessary.

**Keywords:** intracranial verteobasilar artery stenosis, Doppler diagnosis

---

**O-8-3**

**Bow hunter’s syndrome: Usefulness of four-dimensional CT angiography**

Takayuki Kosaka\(^1\), Yuushi Araki\(^2\), Yanosuke Kouzaki\(^1\), Tomohiro Takita\(^1\), Satoru Tawara\(^1\), Chiaki Asao\(^2\), Shunji Yoshimatsu\(^2\)

\(^1\)Department of Neurology, National Hospital Organization Kumamoto Medical Center, \(^2\)Department of Radiology, National Hospital Organization Kumamoto Medical Center

Bow hunter’s syndrome (BHS) is a rare condition resulting from mechanical occlusion or stenosis of the vertebral artery (VA) upon head rotation. Here we report a case of BHS in a 54-year-old woman who complained of dizziness, paresthesia and weakness of the right extremities upon rotation of the head 60 degrees or more to the right. Cervical X-ray, MRI, MRA and carotid Doppler ultrasonography of the neck in the neutral position revealed no abnormality. After rightward rotation of the head by 60 degrees, end-diastolic flow in the left VA disappeared and the peak systolic velocity decreased gradually. We diagnosed BHS and treated the patient conservatively. Four-dimensional CT angiography proved that the symptom was attributable to severe mechanical compression with stenosis of the left vertebral artery at the C1-C2 level upon rightward rotation of the head. Four-dimensional CT angiography is sufficiently effective for evaluation of hemodynamics and anatomical correlations with surrounding organs. For diagnosis of BHS, IA-DSA is undoubtedly the gold standard. However, unlike CT angiography, IA-DSA is an invasive method. To our knowledge, this is the first report describing the usefulness of four-dimensional CT angiography for diagnosis of this uncommon condition.
**O-8-4**

**Relationship between vertebral artery mean velocity and basilar artery stenosis in ultrasonography**

Madoka Okamura, Ryuta Okabe, Hidehiro Takekawa, Yohei Asakawa, Masanari Yamamoto, Yuko Ishii, Etsuo Takada, Koichi Hirata

*1Stroke Division, Department of Neurology, Dokkyo Medical University, Tochigi, Japan, 2Center of Medical Ultrasonics, 3Department of Neurology*

**Purpose:** Time averaged maximum velocity of vertebral artery (TAMV) less than 18cm/s has been suggested as hypoplasia or occlusion of distal side of vertebral artery (VA). However, whether bilateral TAMV <18cm/s are related to basilar artery (BA) stenosis.

**Methods:** Sixty patients with bilateral TAMV <18cm/s were enrolled, and were examined by magnetic resonance angiography. Twenty patients with stenosis greater than 50% (Group BAS) and 40 patients with no stenosis (group NC) were included in the study. Average of bilateral TAMV, pulsatility index, resistance index, systolic/diastolic ratio, and diameter ratio of VA were measured in each group by ultrasonography. Mann-Whitney U test was used to compare differences between two groups, and the receiver operating characteristic (ROC) curve was used to calculate the optimal cutoff values of BAS.

**Results:** The average of TAMV was significantly lower in the group BAS (median value; 12.4 vs. 14.7, p<0.01), but there were no significant differences in other factors. Based on the ROC curve, the sensitivity and specificity of the MV-VA obtained using a cutoff level of 14.1 were 85.0% and 62.5%, respectively for the diagnosis of BA stenosis.

**Conclusions:** Our results suggest that average of TAMV less than 14.1cm/s is associated with BA stenosis.

**Keywords:** basilar artery, vertebral artery, time averaged maximum velocity

---

**O-9-1**

**Cryptogenic brain abscess with patent foramen ovale**

Hirokazu Sadahiro, Sadahiro Nomura, Akinori Inamura, Akiko Yamane, Kazutaka Sugimoto, Yuichi Fujiiyama, Michiyasu Suzuki

*Department of Neurosurgery and Clinical Neuroscience, Yamaguchi University School of Medicine, Ube, Yamaguchi, Japan*

**Purpose:** We have reported that the acceleration time ratio of vertebral artery (VA-AcT) can help diagnose the stenosis of the VA origin (V0). However, there has been no study evaluating the factors that influence VA-AcT ratio. We aimed to investigate the factors contributing to prolongation of VA-AcT ratio.

**Methods:** We evaluated 140 vertebral arteries (VA) and common carotid arteries (CCA). The linear-array probe was set in the common carotid arteries (CCA) at 2 cm above the carotid bulb and set the C 5/6 or 6/7 vertebral body to measure the Doppler waveform. The VA-AcT ratio was calculated as ipsilateral AcT of VA/AcT of CCA. We also performed cerebral angiography to evaluate the severity of V0 stenosis based on European Carotid Surgery Trial as the ground truth. Multiple regression analysis was used to examine the relationship between VA-AcT ratio and V0 stenosis, hypoplasia and VA occlusion.

**Results:** Contralateral VA occlusion and ipsilateral V0 stenosis correlated significantly with the VA-AcT ratio. When contralateral VA occlusion and V0 stenosis were excluded, the ipsilateral V0 stenosis only correlated with the VA-AcT ratio.

**Conclusions:** Contralateral VA occlusion and ipsilateral V0 stenosis may be the significant factors related to prolongation of VA-AcT ratio.

**Keywords:** acceleration time, carotid ultrasonography, vertebral artery

---

**Oral Presentations**

**Session9: Cerebral embolisms, deep vein thrombosis in earthquake victims**

---

**O-8-5**

**Relative factors for acceleration time in vertebral artery -the 2nd report-**

Ryuta Okabe, Hidehiro Takekawa, Madoka Okamura, Yohei Asakawa, Masanari Yamamoto, Yuko Ishii, Yasuhisa Daimon, Koichi Hirata

*1Stroke Division, Department of Neurology, Dokkyo Medical University, Tochigi, Japan, 2Department of Neurology, Dokkyo Medical University*

**Purpose:** We have reported that the acceleration time ratio of vertebral artery (VA-AcT) can help diagnose the stenosis of the VA origin (V0). However, there has been no study evaluating the factors that influence VA-AcT ratio. We aimed to investigate the factors contributing to prolongation of VA-AcT ratio.

**Methods:** We evaluated 140 vertebral arteries (VA) and common carotid arteries (CCA). The linear-array probe was set in the common carotid arteries (CCA) at 2 cm above the carotid bulb and set the C 5/6 or 6/7 vertebral body to measure the Doppler waveform. The VA-AcT ratio was calculated as ipsilateral AcT of VA/AcT of CCA. We also performed cerebral angiography to evaluate the severity of V0 stenosis based on European Carotid Surgery Trial as the ground truth. Multiple regression analysis was used to examine the relationship between VA-AcT ratio and V0 stenosis, hypoplasia and VA occlusion.

**Results:** Contralateral VA occlusion and ipsilateral V0 stenosis correlated significantly with the VA-AcT ratio. When contralateral VA occlusion and V0 stenosis were excluded, the ipsilateral V0 stenosis only correlated with the VA-AcT ratio.

**Conclusions:** Contralateral VA occlusion and ipsilateral V0 stenosis may be the significant factors related to prolongation of VA-AcT ratio.

**Keywords:** acceleration time, carotid ultrasonography, vertebral artery

---

**O-9-1**

**Cryptogenic brain abscess with patent foramen ovale**

Hirokazu Sadahiro, Sadahiro Nomura, Akinori Inamura, Akiko Yamane, Kazutaka Sugimoto, Yuichi Fujiiyama, Michiyasu Suzuki

*Department of Neurosurgery and Clinical Neuroscience, Yamaguchi University School of Medicine, Ube, Yamaguchi, Japan*
**Background:** Brain abscesses cause from Fallot tetrad and pulmonary anterior venous malformation with large right-to-left shunt. However, there are some patients with cryptogenic brain abscess (CBA), which had no such congenital disease and other infections. Patent foramen ovale (PFO) is very common disease of right-to-left shunt. This study shows the concerning between CBA and PFO.

**Methods:** We enrolled patients with CBA in our hospital between January 2003 and January 2013. Patients underwent transesophageal echocardiography (TEE) with micro-bubble method to investigate existence of PFO.

**Results:** Seven patients were included, and 6 patients had PFO, and another patient had pulmonary arteriovenous shunt. Four patients had odontopathy.

**Conclusions:** In this study, all CBA patients had right-to-left shunt. CBA might be caused from paradoxical embolization of the mass of bacteria via PFO.

**Keywords:** Cryptogenic brain abscess, PFO, transesophageal echocardiography

---

**O-9-2**

**Stroke recurrence in embolic stroke without atrial fibrillation**

Juro Jinnouchi, Shigeru Fujimoto, Satomi Mezuki, Takayuki Matsuki, Takao Ishitsuka
Stroke center, Steel Memorial Yawata Hospital, Kitakyushu, Japan

**Purpose:** We investigated predictive factors for a recurrent stroke in embolic stroke patients without atrial fibrillation (AF) on admission and association between stroke recurrences and transesophageal echocardiography (TEE) findings or other clinical risk factors.

**Methods:** Three hundred and sixty-nine consecutive patients without AF on admission who underwent TEE for detecting embolic sources were included. As embolic sources, cardiac disease, right-to-left shunt disease, spontaneous echo contrast, flow velocity in left atrial appendage (LAA) and aortic complicated lesion (ACL, aortic atheroma $\geq 3.5$ mm) were identified using various diagnostic tools including TEE. We observed a symptomatic stroke recurrence or all-cause death during at least 6 months.

**Results:** Fifty-one of 369 patients (13.8%) showed a symptomatic stroke recurrence or all-cause death. After a multivariable analysis, age was higher, aortic atheroma was thicker spontaneous echo contrast was more frequent, diameter of left atrium was larger, and creatinine clearance and outlet flow velocity in LAA was lower in patients with than without PAF. After the multivariable analysis, outlet flow velocity in LAA independently associated with PAF (OR 0.98; 95% CI, 0.96 to 0.99).

**Conclusions:** In patients with embolic stroke and without AF on admission, ACL and diabetes mellitus were independent risk factors for a symptomatic stroke recurrence or all-cause death. Although further studies are required, severe aortic atheroma might be associated with PAF.

**Keywords:** stroke recurrence, aortic complicated lesion, paroxysmal atrial fibrillation

---

**O-9-3**

**Cerebral embolic stroke in patients with patent foramen ovale**

Kiyohito Shinno, Koichi Sato, Tomoya Kinouchi, Mami Hanaoka, Tetsuya Tamura, Hajimu Miyake, Hitoshi Niki, Shinobu Hosokawa, Riyo Ogura, Shinichiro Miyazaki
1Department of Neurosurgery, 2Department of Neuroendovascular Therapy, 3Department of Neurology, 4Department of Cardiology, Tokushima Red Cross Hospital, Tokushima, Japan

**Purpose:** We evaluated the clinical features, transesophageal echocardiography (TEE) findings and prognosis in patients with cerebral embolic stroke due to the patent foramen ovale (PFO).

**Methods:** We studied 17 patients (mean age 60.5 years) with paradoxical cerebral embolism (PCE) among 2238 stroke patients. We investigated the NIHSS scores, diffusion-weighted MRI (DWI) findings, TEE findings, modified Rankin scales (mRS) and stroke recurrence.

**Results:** The mean NIHSS score was 2.8. DWI revealed ischemic lesions in the cerebral or cerebellar cortex in 15 cases. Multiple lesions were detected in nine cases. The maximum diameter of the lesion was less than 1 cm in eight cases. The right to left shunt flow was observed in all cases in the contrast-enhanced TEE with or without Valsalva maneuver. The color flow mode could detect the shunt flow through the PFO without Valsalva maneuver. The mean mRS on discharge was 0.5. Stroke recurrence was occurred in two cases during the mean follow-up periods of 1.4 years.

**Conclusions:** Approximate half of the cases was over 60 years
and showed small multiple cortical lesions. Most of the cases were mild and showed good prognosis. The color flow mode of the TEE was useful in the evaluation of the PCE.

**Keywords:** Paradoxical embolism, patent foramen ovale, transesophageal echocardiography

---

**O-9-4**  
**Multiple bilateral cerebral infarctions in a patient with idiopathic hyperesinophilic syndrome**

Junko Ishii, Shiro Yamamoto, Yoshitaka Tamaki, Kyoko Higashida, Hiroaki Sekiya, Tomoyuki Kono, Hajime Yoshimura, Kenichi Todo, Michi Kawamoto, Nobuo Kohara  
Department of Neurology and Comprehensive Stroke Center, Kobe City Medical Center General Hospital, Kobe, Japan

An 82-year-old woman with a history of asthma was admitted to our hospital because of dyspnea. On admission, laboratory testing demonstrated a white blood cell count of 17700/µL with hyperesinophilia of 9204/µL, 52% of all white blood cells. Various examinations for the cause of eosinophilia including a bone marrow biopsy were unremarkable. The patient was diagnosed with idiopathic hyperesinophilic syndrome. Treatment with intravenous methylprednisolone was initiated. The patient’s eosinophil count normalized within a day. On the sixth day she developed left-sided hemiparesis. Magnetic resonance imaging (MRI) of the brain revealed acute multiple cerebral infarcts in arterial border zones of both the hemispheres. MR angiography was normal. Coagulation factors were normal except elevated D-dimer (12.9 mg/mL). Transthoracic echocardiogram revealed thickening of the left ventricular endocardium with immobile thrombus, compatible with Loeffler endocarditis. Treatment with oral prednisolone was started at 30mg per day and then tapered to a maintenance dose of 5mg per day. Anticoagulation was started for stroke prevention. Ten months later echocardiogram showed reduced size of the thrombus, and MRI revealed no new cerebral infarctions. The cause of cerebral infarction in patients with hyperesinophilia is thought to be a thromboembolism or the cerebrovascular endothelial toxicity of eosinophils. In this patient, the cerebral infarcts may be the result of embolism from the left ventricular thrombus.

**Keywords:** cerebral infarctions, hyperesinophilic syndrome, intraventricular thrombus

---

### Oral Presentations

**Session 10: Carotid endarterectomy / Carotid artery stenting**

**O-10-1**  
**Peak systolic velocity and acceleration time. -Which is more available for assessing severe stenosis of internal carotid artery?-**

Yuki Kamiya¹, Misako Mori², Ayako Kuriki³, Hiroo Ichikawa¹, Mitsuru Kawamura³  
¹Department of Neurology, Showa University Fujigaoka Hospital, ²Section of Clinicopathology, Room of Physiology, Showa University Fujigaoka Hospital, ³Division of Neurology, Department of Internal Medicine, Showa University, School of Medicine, Japan

**Purpose:** The aim of this study was to investigate correlations of diameter stenosis (ECST and NASCET method), peak systolic velocity (PSV) and acceleration time (AcT), and to clarify the each characteristic and availability in severe stenosis of internal carotid artery (ICA).

**Methods:** We consecutively evaluated 31 ICAs which had more than 200cm/s of PSV. ECST, PSV and AcT were measured by using carotid ultrasonography. AcT was measured at distal ICA adequately away from stenosis by convex-array probes. NASCET was measured in digital angiography in 29 cases.

**Results:** PSV and AcT significantly correlated with diameter stenosis except relationship of ECST and PSV. However, the correlation between PSV and diameter stenosis was slightly poor and had varied greatly. In some cases, there was not a marked elevation in PSV despite severe stenosis. AcT had a good correlation with ESCT and NASCET (correlation coefficient r =0.66 and 0.51, respectively), including in extremely severe stenosis. But in less than 70% stenosis, AcT remained mostly level, so could not reflect the degree of stenosis.

**Conclusions:** PSV was available to assess ICA severe stenosis. But especially in more severe stenosis, AcT is capable of making an accurate assessment of stenosis.

**Keywords:** internal carotid artery, severe stenosis, acceleration time

---

**O-10-2**  
**Intraoperative TCD monitoring of MCA flow velocity can predict hyperperfusion syndrome after CEA**
Background & Purpose: Hyperperfusion syndrome (HPS) is a severe complication after CEA and CAS and should be diagnosed immediately. We investigated whether intra-operative monitoring of middle cerebral artery (MCA) flow velocity by using transcranial Doppler (TCD) was useful for predicting postsurgical HPS.

Methods: In 10 patients who underwent CEA, the ipsilateral MCA flow velocities as well as blood pressures and heart rates were monitored during the operation. SO2 of the bilateral frontal lobes were also monitored by using INVOS®. We observed intra-operative changes in each parameter and investigated relationships between those changes and postsurgical HPS.

Results: Only one patient showed post-operative HPS. Nine patients without HPS had an intra-operative mean velocity increase of ≤100%, and in 8 of the 9 patients, a post-operative mean velocity increase was ≤0%. On the other hand, one patient with HPS showed an intra-operative mean velocity increase of 193% and a postoperative mean velocity increase of 20%. The MCA flow velocity after the clamp of ICA decreased remarkably to unmeasurable level. Moreover, his intra-operative changes in MCA mean flow velocity was paralleled with his intra-operative changes in blood pressure. His MCA mean flow velocity ratio (velocity after CEA / velocity before CEA) was 2.1 on transcranial color-coded duplex ultrasonography (TCCS).

Conclusions: In the patient with postoperative HPS, an intra-operative MCA mean flow velocity increase was remarkable. Intra-operative TCD and post-operative TCCS were useful for the prediction and monitoring of post-operative HPS.

Keywords: Transcranial Doppler, Hyperperfusion syndrome, CEA

O-10-3
Preoperative prediction for the changes of intraoperative findings in SEP or EEG during carotid endarterectomy

Yui Nagai, Yuji Kodama, Chifumi Kinugasa, Etsuko Kurokita, Koji Ikeda, Sayumi Miyake
Ohnishi Neurological Center Department of Clinical Laboratory, Japan

Proposal: We examined whether preoperative evaluations predict changes in EEGs and SEPs during CEAS.

Methods: 112 cases with completed preoperative evaluations of the brain flow (SPECT or Xe-CT) were chosen from 172 CEAs performed between 2009 and 2012. We analyzed the relationship between changes in intraoperative monitoring during CEAs and tests on cerebral blood flow, collateral circulation, hemoglobin quantity, area stenosis rate, and stump pressure.

Results: The cases without collateral circulation showed noticeable changes in EEG and SEP waves during operation, compared to cases with collateral circulation. We found little change in waveforms for cases with higher area stenosis. There was no significant relationship between changes in waveform and the evaluations of brain blood flow, hemoglobin quantity, and stump pressure.

Discussion: Evaluation of preoperative tests is crucial in light of its significant influence on maintaining cerebral blood flow during surgery. Our findings on area stenosis may be explained by the development of collateral circulation.

Conclusions: The presence or absence of collateral circulation and area stenosis rate influence changes in intraoperative monitoring during CEAs.

Keywords: Preoperative prediction, intraoperative, collateral circulation

O-10-6
Study on the aftercare by carotid Duplex ultrasonography in the patients who ended a routine follow-up of the stented vessels

Hidemasa Nagai, Peng Ruoyu, Fumio Nakagawa, Hirotake Eda, Shinya Hagiwara, Mitsuhito Daisu, Takeshi Uemura, Takeshi Miyazaki, Yasuhiko Akiyama
Department of Neurosurgery, Shimane University Faculty of Medicine, Izumo, Japan

Introduction: In-stent restenosis (ISR) is a major problem that sometimes occurs during the long-term follow-up of patients after carotid artery stenting (CAS). Such patients are usually followed up routinely using 3D enhanced computed tomography (3D-CTA) for 2 years after the procedure. After the final 3D-CTA examination, the patients are managed by CDU in order to predict late-onset ISR. Here, using stented patients who were still being followed up, we compared between no ISR and high grade ISR, and studied the risk factors related to late-onset ISR after a final 3D-CTA.

Materials and Results: The inclusion criteria were 3D-CTA within the last 2 years, and subsequent follow-up using CDU. The CDU data were not available in 27 cases. A final total of 22
vessels met the study’s inclusion criteria. ISR was defined as more than 40% stenosis by 3D-CTA. We compared the no-ISR group and the ISR group for the 22 arteries. Although the results did not reach statistical significance because of the small number of ISR cases examined, more patients in the ISR group had a history of cancer than those in the no-ISR group.

**Conclusions:** A history of cancer appears to be a factor predictive of late-onset ISR. We speculate that ultrasound may be able to predict late-onset ISR in terms of the thickness of neo-intimal hyperplasia.

**Keywords:** carotid Duplex ultrasonography, in-stent restenosis (ISR), target lesion revascularization (TLR)

---

**Poster Session 1**

**Paramedical session**

**P-1-1**

**Development of the carotid report system for the Purpose of the computerization of the automatic input of measurement data and the handwritten schema**

Toshiya Ozaki  
Department of Clinical Laboratory, Kojunkai OBP Clinic, Osaka, Japan

**Introduction:** The carotid report begins in intima-media thickness(IMT) and plaque thickness. Then, until a vascular diameter, stenosis rate, blood flow velocity data, mention of many digital data is necessary. Also, unlike other ultrasonography regions, mention of the schema is required. Furthermore, we require a complicated illustration and much comment. Therefore, at PACS induction, a user defined DICOM-SR and realized the automatic input of measurement data. Also, we developed the carotid report system, which adopted the computerization of the handwriting schema with the scanner. Because we obtained these one-year use experience, we report it including a future problem.

**System summary:** The user setting was given a measurement item in Hitachi Aloka Prosound-F75. DICOM-SR, which defined the user inputs it into report support system (Mity For Report-MCR) made in Infinity Medical Soft Corporation via PACS automatically. Also, the schema prints a sketch depending on the blood stream of the patients first than a report system. Then, we fill in an illustration and comment by handwriting and are computerized with the document scanner of the desktop.

**Conclusions:** A measurement item is input all into a report system automatically by setting of DICOM-SR by the user definition. Therefore we were able to largely shorten paper chase time at the same time as an entry error of measurement data was gone. Also, the computerization with the scanner of the handwriting schema enabled a mention of the illustration which was more detailed than mouse operation and the pen touch with the tablet and the comment.

**Keywords:** carotid report, DICOM-SR, handwritten schema

---

**P-1-2**

**Is ABI able to use as predictive factor for carotid artery stenosis?**

Nao Sakamoto\(^1\), Shingo Kayano\(^2\), Ikumi Okada\(^1\), Reika Satou\(^1\), Ikuko Fukuya\(^1\), Toshiyuki Onda\(^1\), Yasuyuki Yonemasu\(^3\), Akira Takahashi\(^1\), Tadashi Nonaka\(^3\)

\(^1\)Department of Physiology, Sapporo Shiroishi Neurosurgical Hospital, \(^2\)Department of Radiology, Sapporo Shiroishi Neurosurgical Hospital, \(^3\)Department division of neuroendovascular therapy, Sapporo Shiroishi Neurosurgical Hospital, Japan

**Background & Purpose:** Ankle Brachial Pressure Index (ABI) has been used for evaluation of atherosclerosis of peripheral artery and Carotid ultrasound sonography is also an effective alternative for evaluation of carotid artery stenosis. In this study, we retrospectively compared ABI to the Plaque Score (PS) obtained from Carotid ultrasound evaluation and investigated the relationship of both factors.

**Methods:** PS and ABI were measured in 655 patients (Sex: male=360, female=295, Age: 23-95, mean=69.8 years old) between November 2011 and February 2013. Those patients were classified into the three groups by the ratio of ABI (Group A: ABI≤0.9, Group B: 0.9<ABI≤1.4, Group C: ABI>1.4) and analyzed the correlation of remarkable carotid artery stenosis those were performed Carotid artery stenting (CAS) or Carotid Endarterectomy(CEA) in each group.

**Results:** Mean PS were 11.41 in Group A, 5.76 in Group B and 4.83 in Group C. PS in the group A indicated statistically higher than those of the other groups. The number of patients those were performed CAS or CEA were 7 cases (11.5%) in the group A, 12 cases(2.1%) in the group B and none case (0%) in the group C.

**Conclusions:** The patients in the group A (ABI≤0.9) demonstrated that remarkable high–PS and frequent carotid stenosis that were indicated for surgical procedures. Therefore there
would be a strong correlation between ABI and PS, and it seems that ABI will be a good predictor of carotid artery stenosis.

**Keywords:** ABI, ultrasonography, CAS

---

**P-1-4**

**Ultrasoundographic findings of the common carotid artery in patients with internal carotid arterial aplasia or hypoplasia, the 2nd report.**

Michiko Ito¹, Yoko Ito¹, Shinsaku Hatake¹, Yoshiyuki Wakugawa², Masahiro Yasaka², Yasushi Okada²

¹Clinical Laboratory, National Hospital Organization Kyushu Medical Center, ²Cerebrovascular Center and Clinical Research Institute, National Hospital Organization Kyushu Medical Center, Japan

**Background:** We rarely encounter aplasia or hypoplasia of the internal carotid artery (ICA). Generally, the ICA aplasia is characterized by defect of the bifurcation of the carotid artery. We examined ultrasonographic findings among the subjects diagnosed ICA aplasia or hypoplasia.

**Methods:** We included 15 subjects with ICA aplasia or hypoplasia in this study from Jan. 2004 to Apr. 2013, and performed carotid ultrasonographic examination and studied ultrasonographic findings such as diameters, systolic flow velocity (FV), diastolic FV, mean FV, and pulsatility index (PI) of their common carotid arteries (CCA).

**Results:** The subjects consisted of 10 patients (4 men, 6 women, mean 54 years old) with ICA aplasia and 5 (1 man, 4 women, mean 45 years old) with ICA hypoplasia. The diameters of the ipsilateral CCA were significantly narrower than those of the contralateral CCA (4.74 ± 0.8mm vs 7.68 ± 1.0mm, p<0.01). Among all subjects, the diameters of the ipsilateral CCA were less than 6mm, and then those of the contralateral CCA were more than 6mm. The difference of the diameters between bilateral CCA were more than 2mm. There were no differences of systolic and diastolic FV between bilateral CCA. The difference between ICA aplasia and hypoplasia was the presence or absence of the carotid ampulla.

**Conclusions:** Ultrasonographic features of ICA aplasia or hypoplasia seems that diameter of the ipsilateral CCA is less than 6mm and difference in the diameter between the bilateral CCA is more than 2mm.

**Keywords:** ICA aplasia, ICA hypoplasia, ampulla

---

**P-1-5**

**Useful of pulsatility index by transcranial color flow imaging for cerebral vasospasm after subarachnoid hemorrhage**

Ayumi Arai¹, Hidetaka Mitsumura², Toshihiro Ishibashi¹, Yuki Ichiro³,Hideki Arakawa¹, Shogo Kaku³, Ikki Kajiwara³, Kengo Nishimura¹, Yuichi Murata¹

¹Department of Diagnostic Radiology, The Jikei University Hospital, ²Department of Neurology, The Jikei University School of Medicine, ³Division of Endovascular Neurosurgery, The Jikei University School of Medicine, Japan

**Background:** Middle cerebral artery (MCA) flow velocity mean (Vm) 120cm/s or more is currently diagnosed as vasospasm positive.

**Purpose:** To investigate useful of pulsatility index (PI) by transcranial color flow imaging for cerebral vasospasm after subarachnoid hemorrhage (SAH).

**Methods:** Bilateral MCA were monitored every day as long as 2 weeks of the onset. 42 (Men 21, mean age 58.1 ± 16.6) consecutive SAH patients were monitored by TC-CFI. The count of exam was 839. We compared findings between MRA or DSA and TC-CFI (Vm・PI) were shot on the same day. MRA or DSA findings were classified No spasm, M1 spasm and M2 spasm.

**Results:** 36 of 42 patients were able to monitor. Mean Vm were No spasm (n=55) 113.0 ± 41.1cm/s, M1 spasm (n=16)169.1cm/s ± 45.7cm/s, M2 spasm (n=14)189.9cm/s (P<0.001). Vm rose order in which No spasm<M1 spasm<M2 spasm. Mean PI were No spasm 0.88 ± 0.28, M1 spasm 0.56 ± 0.10, M2 spasm 0.66 ± 0.22(P<0.005). PI decreased No spasm>M1 spasm, However M2spasm>M1 spasm. There are 2 positive cases diagnosed by DSA or MRA, although Vm120cm/s. Both PI were lower than mean PI of No spasm.

**Conclusions:** It was suggested that PI is useful to diagnosis area of cerebral vasospasm after SAH.

**Keywords:** TC-CFI, Vasospasm, PI

---

**P-1-6**

**Color duplex sonography in diagnosis of temporal arteries: three case reports**

Yumiko Mori, Shin-ichiro Tsuji, Sumi Takeuchi, Aya Murakami, Miki Yamauchi, Yumiko Aoki, Kimiyo Hashimoto

Kyoto Social Welfare Foundation Kyoto Katsura Hospital

**Purpose:** As for temporal arteritis, having angiostenosis with dark halo sign, which is characteristic by sonography or occlude
views or not is useful for a diagnosis. Because we examined B-mode ultrasound and a clinical background, a clinical diagnosis this time, we report it.

Subjects and Methods: We examined supersonic wave views and a clinical background, a clinical diagnosis about 3 cases that dark halo sign was detected using B-mode ultrasound in our hospital in 2012.

Results: Case 1 is inspected for the doubt of the complications of the rheumatism-related myalgia symptom in 88-year-old woman. Even MRA accepted a wall thickening equally, and temporal arteritis was diagnosed. Case 2 is a 76-year-old woman; for scalp skin cancer after a skin graft. We inspect it in acknowledgment of a headache, the strand-formed hardening of the scalp blood vessel. The transient arteritis with the operation was diagnosed. An 82-year-old man slight fever, arthralgia continued case 3, and a rheumatism-related myalgia symptom was doubted. still disease is diagnosed in acknowledgment of a serum ferritin high price without recognizing a giant cell by the biopsy of the superficial temporal artery and thinks that it was influence of this inflammation.

Conclusions: Because dark halo sign was seen in even other inflammatory diseases, attention is necessary. We stand on having blood vessel narrowness, stenosis and confinement or not, the clinical background and must be diagnosed.

Keywords: temporal arteritis, dark halo sign

Poster Session 2
Arteriosclerosis

P-2-1
The relationship between coronary artery disease and carotid ultrasonography findings in acute coronary syndrome

Shigeru Toyoda1, Hidehiro Takekawa2, Naoyuki Otani1, Koichi Hirata1, Etsuo Takada3, Teruo Inoue1
1Department of Cardiovascular Medicine, Dokkyo Medical University, Tochigi, Japan, 2Department of Neurology, 3Center of Medical Ultrasions

Purpose: The degree of atherosclerotic change in the carotid artery has been shown to correlate the extent of coronary artery disease; however it remains unclear in Japanese patients. We conducted a pilot study to evaluate the clinical correlation of carotid atherosclerotic changes in Japanese patients with acute coronary syndrome (ACS).

Methods: Twenty ACS patients with 1-vessel disease, 12 with 2-vessel disease, 17 with 3-vessel disease and 8 with left main coronary artery disease (LMCD) were included in this study. The plaque score (PS), maximal intima media thickness (IMT) of the common carotid artery (IMT-Cmax), IMT of carotid bulb (IMT-Bmax), the existence of soft plaques and severe stenosis were measured. Kruskal-Wallis test and multiple regression analysis were used for statistical analysis.

Results: There were no significant differences in background characteristics among the four groups. With regard to the ultrasonographic findings, PS and IMT-Cmax were significantly higher in LMCD group than other groups. In multiple regression analysis, that greater PS correlated difference of groups.

Conclusions: Our results suggest that severe carotid atherosclerotic changes may reflect extensive coronary atherosclerotic changes such as LMCD. The increased PS might be a possible indicator for coronary artery bypass grafting.

Keywords: acute coronary syndrome, atherosclerosis, carotid ultrasonography

P-2-3
Relationship between diameter of common carotid artery and brachial artery (2nd report)

Masanari Yamamoto1, Hidehiro Takekawa1, Yohei Asakawa1, Madoka Okamura1, Koichi Hirata1
1Stroke Division, Dokkyo Medical University, Tochigi, Japan, 2Dokkyo Medical University, Tochigi, Japan

Purpose: Recent studies have suggested increased diameters of the brachial artery may be a useful indicator for subclinical coronary artery diseases. The present study aimed to investigate the relationship between the diameters of brachial artery (BAD) and common carotid artery (CAD) in patients with cerebral infarction.

Methods: Thirty-three patients with acute atherothrombotic brain infarction (group ATBI), 33 cardiogenic cerebral embolism (group CE) and 31 normal controls (group NC) were enrolled. BAD and CAD at the end-diastolic phase were measured in each group by ultrasonography. Kruskal-Wallis test followed by Scheffe’s post-hoc test was used to compare differences among three groups.

Results: With regard to the ultrasonographic findings, BAD was significantly higher in the group ATBI than group CE and NC (median value: 5.3mm, 4.4mm and 4.5mm, respectively), and CAD was also significantly higher in the group ATBI than group CE and NC (median value: 8.5mm, 8.1mm and 7.1mm,
respectively). In addition, the CAD was higher in the group CE than group NC.

**Conclusions:** Based on these results, greater BAD may reflect subclinical atherosclerosis and BAD can be used as a useful parameter for differentiating ATBI from CE.

**Keywords:** brachial artery diameter, common carotid artery diameter, differential diagnosis

**P-2-4**

Comparison of flow-mediated vasodilatation and cervical ultrasonography on the basis of clinical types of stroke

Utako Adachi, Chisako Yano, Yukiko Tsutsumi, Mutsumi Iijima, Shinichiro Uchiyama

Department of Neurology, Neurological Institute, Tokyo Women’s Medical University School of Medicine, Japan

**Purpose:** We investigated endothelial function, intima media thickness (maxIMT), plaque score (PS) in patients with three types of ischemic stroke, and compared with control group.

**Methods:** We investigated endothelial function by using flow-mediated vasodilatation (FMD) and measured maxIMT and PS by using ultrasonography.

**Results:** %FMD was significantly low in patients with atherothrombotic stroke and cardioembolic stroke. maxIMT was significantly high in patients with atherothrombotic stroke. PS was significantly high in patients with atherothrombotic stroke and cardioembolic stroke. Whereas no significant differences in patients with lacunar stroke.

**Conclusions:** We guessed that there are differences in three types of cerebral infarction about pathological structure of atherosclerosis.

**Keywords:** FMD, maxIMT, PS

**P-2-5**

Sonographic parameters of the common carotid artery for detection of the middle cerebral artery M1 segment stenosis and occlusion

Takahito Nishihira¹, Hidehiro Takekawa¹, Ryuta Okabe³, Yohei Asakawa¹, Madoka Okamura¹, Masanari Yamamoto¹, Keisuke Suzuki², Koichi Hirata³

¹Stroke Division, Department of Neurology, Dokkyo Medical University, Tochigi, Japan, ²Department of Neurology, Dokkyo Medical University

**Purpose:** ED ratio >1.3 has been suggested as occlusion of the segment 1 of middle cerebral artery (M1) due to cardioembolic infarction. However, it remains unclear whether all subtypes of brain infarctions are related to ED ratio.

**Methods:** Ten patients with acute stroke who had no stenosis or occlusion at internal carotid artery and M1 (Group NC) and 10 patients with M1 stenosis > 50% (Group M1S) were enrolled. Peak systolic velocity (PSV), time averaged maximum velocity (TAMV), end diastolic velocity (EDV), pulsatility index (PI), and resistance index (RI) were measured at the common carotid artery. The side-to-side ratio of PSV, TAMV and EDV were calculated by the affected side/the unaffected side, and those of PI and RI were calculated by the unaffected side/the affected side in group M1S. In addition, the ratio in group NC, was calculated by higher/lower value. Mann-Whitney’s U test was used to compare differences between two groups.

**Results:** The ratio of PSV was significantly lower in the group M1S than the group NC (median value; 0.920 vs. 1.06, p=0.0233), but there were no significant differences in other factors.

**Conclusions:** Our results suggest that the ratio of PSV might be associated with M1 stenosis.

**Keywords:** peak systolic velocity, middle cerebral artery, stenosis

**Poster Session 3**

New technology

**P-3-1**

Usefulness of pocket-size portable ultrasonography for Neurorsurgical treatment

Kentaro Hayashi¹, Yohei Tateishi², Tomohito Hirao³, Nobutaka Horie¹, Tsuyoshi Izumo¹, Akira Tsujino¹, Izumi Nagata¹

¹Department of Neurosurgery, Nagasaki University School of Medicine, ²Stroke Center, Nagasaki University School of Medicine, ³Emergency Medical Center, Nagasaki University School of Medicine, Japan

Following with progression of technology, the ultrasonography system becomes smaller and smaller. The pocket-size portable ultrasound VSCAN (GE healthcare) has been developed. The size and weight of VSCAN is 135 mm × 73 mm and 390g respectively. This excellent portability allows physician to per-
form ultrasonography anywhere in the hospital and its usefulness has been reported in cases of Cardiology, Gynecology, and Emergency medicine. We preliminary employed VSCAN for 25 Neurosurgical treatments and evaluated carotid artery, femoral artery, inferior vena cava and so on. The handling of VSCAN was quite simple and color flow image was available. However, the resolution of the image is not enough to evaluate arterial walls of carotid artery or femoral artery. The probe was fixed and only one type for deep-seated region such as thoracic or abdominal organs. The pocket-size portable ultrasound is not useful for neurosonology in this version. The development of linear probe is required.

**Keywords:** ultrasonography, portability, neurological surgery, bedside, emergency room

---

**P-3-2**

Third generation prototype of a probe holder for transcranial color-coded Doppler

Satoshi Ohyama\(^1\), Masatoshi Koga\(^2\), Kaoru Endo\(^1\), Rieko Suzuki\(^1\), Haruko Yamamoto\(^3\), Kazunori Toyoda\(^1\), Kazuo Minematsu\(^1\)

\(^1\)Department of Cerebrovascular Medicine, \(^2\)Division of Stroke Care Unit, \(^3\)Department of Advanced Medical Technology Development, Research and Development Initiative Center National Cerebral and Cardiovascular Center, Japan

**Backgrounds and propose:** Transcranial color-coded Doppler (TCCS) is useful to evaluate blood flow velocity and microembolic signals of intracranial artery at bedside. Because intracranial blood arteries are visible using TCCS, it is easier to detect the flow velocity as compared with transcranial Doppler (TCD).

Since no probe holder has been made for TCCS, the probe is usually handheld when assessing whether an occluded artery is recanalized in patients with acute ischemic stroke. Therefore we tried to develop a probe holder for TCCS and made the 3\(^{rd}\) generation prototype.

**Methods and Results:** Because it is often difficult to keep rest for acute stroke patients, we decided to make a helmet shaped probe holder which fits head firmly regardless of head movement. The newly developed points were as follows. First, the probe had the capability to hold several probes with different size. Next, head fitting was improved. Third, the movable joints of the holder arm increased from two to three points and this expanded the range of arm movement. Fourth, a side change method to opposite side was improved with a quick lever. Finally, the stability was improved with a special pedestal. A long time monitoring with the probe holder was feasible and safe in healthy volunteers. A few volunteers with a large head circumference complained mild headache.

**Conclusions:** We developed the 3\(^{rd}\) generation prototype of a probe holder for TCCS. The probe holder will be evaluated regarding the clinical utility in patients with acute stroke.

**Keywords:** probe holder, TCCS, long time monitoring

---

**P-3-3**

Quality control of IMT measurements using CardioHealth Station

Hirotoshi Hamaguchi\(^1\), Noriko Fukuzumi\(^2\), Hitomi Kousaka\(^2\), Yoshinobu Watanabe\(^3\), Hiroshi Matsuo\(^4\)

\(^1\)Department of Neurology, Kobe University Hospital, \(^2\)Department of Clinical Laboratory, Kobe University Hospital, \(^3\)Panasonic Healthcare Co., Ltd., \(^4\)Matsuo Clinic, Japan

**Purpose:** The accuracy of carotid intima-media thickness (IMT) measurements that depend on both the equipment and the skill of the examiner have yet to be discussed. In this study, IMT measurements obtained using general-purpose ultrasound devices were compared with those obtained in a phantom model using a newly developed ultrasound device, CardioHealth Station (CHS).

**Methods:** The theoretical value of the phantom model was set to 0.835 mm. Three sonographers measured the maximum and mean IMT 50 times using CHS, \(\alpha_{10}\) and \(\alpha_{7}\) ultrasound devices (Hitachi-Aloka).

**Results:** The average max IMT values were 0.858 ± 0.032, 1.034 ± 0.068, 1.021 ± 0.068 and 1.085 ± 0.123 mm using CHS, \(\alpha_{10}\), and \(\alpha_{7}\) in manual mode and in automatic mode, respectively. The average mean IMT values were 0.813 ± 0.027, 0.979 ± 0.054, 0.980 ± 0.060 and 0.989 ± 0.087 mm using CHS, \(\alpha_{10}\) and \(\alpha_{7}\) in manual mode and in automatic mode, respectively. The coefficient of variation was lowest in CHS.

**Discussion:** Obtaining clear images is the most important point of IMT measurements. CHS analyzes movement of the vessel wall in real time using RF data, and immediately displays IMT value. CHS appears to provide more accurate measurements of IMT.

**Keywords:** Carotid IMT, the phantom model, CardioHealth Station
P-3-4
The sonographic findings of facial bone fracture and extracranial tissue findings

Tsutomu Nakaoka
The department of Neurosurgery, Hoya Kosei Hospital, Tokyo, Japan

Purpose: The extracranial parts assessment by Ultrasound sonography (US)

Methods: The 117 cases were objective. The instrument was HDI5000 (Philips), linear probe (L12-5). The modalities were B-mode and Pulse Inversion Harmonic imaging (PIHI) with contrast agents (ICIp). The impedance calculation and analysis of the preprocessing data by QLAB were studies after the examination. Furthermore time intensity curves (TIC) and Color coded Imaging (CCI) were made.

Results and discussion: The B-mode was observed the facial bone fractures and edges. The serial repairing process findings were observed. The muscular CCI revealed the perfusion disturbance directly, though the examination needed an idea to reject the circulation disturbance by the pressure of probe. The cranial nerves were lower intensity and unclear interior structure than the peripheral nerves. The PI was similar findings as the indocyanine green video angiography (ICG). TIC and PI images provided us the direct and objective findings.

Case: She came to our hospital complaining wound infection. Cranioplasty was done after 6 months from the remove of the infected skull bone. As the skull skin was very thin, we checked skin thickness and state by B-mode. As we referred to those findings, the cranioplasty was done not eventfully.

Conclusions: US are useful as the extracranial structures assessment and provide us some new data that is more precised than CT and MRI.

Keywords: Ultrasound sonography, neurosurgical operation, temporal muscle

Poster Session 4
Basic research in neurosonology 1

P-4-1
Schlieren estimation of the standing wave suppression by random modulations in the transcranial ultrasound irradiation

Osamu Saito1, Jun Shimizu1, Masatoshi Koga2, Hidetaka Mitsumura3, Masayuki Yokoyama1, Yasuyuki Iuchi3, Takeki Ogawa4, Hiroshi Furuhata11
1Medical Engineering Laboratory, Research Center for Medical Science, The Jikei University of Medicine, 2Division of Stroke Care, National Cerebral and Cardiovascular Center, 3Department of Neurology, The Jikei University School of Medicine, 4Department of Emergency Medicine, The Jikei University School of Medicine, Japan
1Prof. Furuhata died August 11, 2012

Purpose: Sonothrombolysis is a promising treatment method of acute ischemic stroke. However, there is a problem of safety; many cerebral hemorrhages were reported in the past therapeutic trial. The hemorrhages were considered to be caused by standing waves. The Purpose of the present study is to reduce the standing waves by random modulation.

Methods: We investigated two random modulation methods. One is PSRF (Periodic Selection of Random Frequencies), whose frequency is changed randomly at certain time intervals. The other is RSBIC (Random Switching of Both Inverse Carriers), which inverses the phase at random time. Using the schlieren equipment, we observed the standing waves made by human skull in a water tank. To quantify the degree of reduction, we used an index SWR. The lower SWR means the higher effect of the reduction. We calculated the SWR for six ROIs on the schlieren images.

Results: The averages of the SWR were 0.339 for sinusoidal activation (no modulation), 0.109 for the PSRF and 0.080 for the RSBIC. The RSBIC was the most effective (p=0.002, p<0.001).

Conclusions: It was shown that RSBIC can reduce the standing waves. Safer sonothrombolysis can be realized by usage of the RSBIC.

Keywords: Sonothrombolysis, standing waves, random modulation

P-4-2
Safety evaluation of superheated perfluorocarbon nanodroplets for novel phase change type neurological therapeutic agents

Jun Shimizu1, Reiko Hashiba2, Takahiro Fukuda3, Takuya Inagaki1, Hiroshi Hano1, Rei Asami2, Ken-ichi Kawabata3, Masayuki Yokoyama1,6, Hiroshi Furuhata11
1Medical Engineering Laboratory, 2Department of Radiology, 3Division of Neuropathology, 4Department of Pathology, The Jikei University School of Medicine, 5Central Research
Purpose: Superheated perfluorocarbon nanodroplet (SPN), which can turn into microbubble (MB) upon ultrasound (US) trigger, may have advantages in sonothrombolysis. We performed a safety evaluation of SPN in vivo.

Methods: 19 male rabbits (2.59 ± 0.14 kg) were assigned to three groups: Control group (n = 6), 2.2 mL/kg of physiological saline i.v.; PL group (n = 7), 25 mg/kg of phospholipid-coated SPN i.v.; and AA group (n = 6), 25 mg/kg of poly aspartic acid derivative coated SPN i.v. Biochemical blood examinations were performed at pre-injection, 1, 4, and 7 days after injection. Organ samples including heart, lungs, liver, spleen and kidneys were harvested after euthanasia.

Results: Within an hour after administration, both the PL and AA groups showed a reversible respiration change. One animal in the AA showed transient nystagmus about 20 min after administration; however, there was no pathological damage. No histological damage was found in any organ sample in all animals. Moreover, no significant differences were found in the biochemical blood examination between the PL, AA, and Control groups.

Conclusions: No neurological damage or histological change was found with two SPNs. We will further investigate the SPN-assisted sonothrombolysis based on the 500-kHz US exposure.

Keywords: Perfluorocarbon, Nanodroplets, Sonothrombolysis
icated U-87MG cell with $I_{pu}$ of 508 mW/cm$^2$ was changed between 9 % and 56 %. It was observed lysed and non-visible cells.

**Conclusions:** These experimental results indicated that it is possible to induce cell death to glioblastoma U-87MG cell by ultrasound exposure.

**Keywords:** Glioblastoma, ultrasound exposure, cell death

**P-4-5**

Fabrication and estimation of cell culture flask with acoustic windows for culture and ultrasound irradiation

Sakino Iwashiro, Akiko Watanabe, Masatsune Minai, Hiroyuki Nishimura, Shinichi Takeuchi
Graduate school of Engineering, Toin University of Yokohama, Kanagawa, Japan

**Purpose:** The commercial polystyrene cell culture flasks were employed as containers of target brain tumor cells exposed to ultrasound, there was a problem that was reflected at the surface of the flask with different specific acoustic impedance from water outside of the flask and culture medium in the flask, but did not reach the cells sufficiently. Therefore, we prepared the original cell culture flasks.

**Methods:** The cell culture flask with acoustic window for ultrasound irradiation has thin polymer film acoustic windows at top and bottom ends of the hollow cylindrical plastic pipe. In developing the flask, it is necessary to consider the following issues in detail. ①Material of the flask body, ②Material of the thin polymer film for the acoustic window, ③Adhesion method between the thin polymer film acoustic window and hollow cylindrical plastic pipe flask body.

**Results and Conclusions:** As results, we obtained the conclusion that it is desirable to adhere to Lumirror or OPS film as acoustic window to the flask body by heat welding. OPS film acoustic window could be adhered to the end of polystyrene or acrylic resin flask body, but Lumirror film acoustic window could not be adhered to the end of polystyrene or acrylic resin flask body.

**Keywords:** adherent cell, cell culture flask, acoustic window film

**Poster Session 5**

Transcranial color coded flow imaging

**P-5-2**

Transcranial Doppler monitoring during intra-arterial infusion of fasudil hydrochloride for vasospasm

Satoshi Kuramoto, Kyohei Kin, Yoshio Hisamatsu, Atsushi Katsumata, Yasuhiro Ono, Yuji Goda, Masamitsu Kawauchi
Department of neurosurgery, Kagawa prefectural central hospital, Takamatsu, Japan

**Purpose:** Transcranial Doppler (TCD) has been validated as screening for vasospasm after subarachnoid hemorrhage. We assessed whether TCD velocities were changing during intra-arterial infusion of fasudil (a Rho kinase inhibitor) for severe vasospasm after subarachnoid hemorrhage (SAH). We reviewed patients with
SAH who underwent daily TCD monitoring. We recorded velocity of middle cerebral artery (MCA) using portable ultrasound recorder (trans-temporal trans-cranial color duplex ultrasound, B-mode and M-mode) on bedside. If we found symptomatic vasospasm or elevation of velocity, the patient underwent endovascular therapy (balloon angioplasty or fasudil infusion) and we were monitoring velocity of MCA using SONARA(TM) during procedure. MCA mean-flow velocity (MFV) decreased after intra-arterial infusion immediately, and angiographical vasospasm was also improved. After the procedure, MCA mean-flow velocity was increasing again, we were continuing the monitoring, and MFV eventually returned to normal. Transcranial Doppler ultrasound is useful tool for both diagnosis and intraoperative monitoring during management for severe vasospasm.

**Keywords:** Transcranial Doppler ultrasound, vasospasm, Rho kinase inhibitor

---

**P-5-3**

**The sonographic study of cerebral ischemia by the linear probe**

Tsutomu Nakaoka
The department of Neurosurgery, Hoya Kosei Hospital, Tokyo, Japan

**Purpose:** The usefulness of perioperative ultrasound sonography (US)

**Methods:** The 107 cases was objective. The instrument is HDI5000, linear probe (L12-5). We usually observe infarction by B-mode. We analyzed the preprocessing data by QLAB after the examination.

**Results:** The B-mode findings of cerebral infarction on the acute stage discriminated from Grade I (normal) from Grade V (complete disturbance). There’re some mismatched findings between B-mode and MRI findings. There’re various ischemic sonographic findings at the infarction that diagnosed by CT and MRI. Furthermore the Gr.II-III was observed in the neighborhood of infarction. We analyzed them by the calculation of their impedance statistically. There’re significant differences among each Grades. Furthermore the microcirculation (MC) and leptomeningeal anastomosis (LMA) were observed on the Gr.IV & V during the acute stage and their blood flow velocity was 1-2 cm/sec. The MC was observed within 1 week after onset and the same parts changed to scar after 3 months.

**Conclusions:** There’re various ischemic levels in cerebral infarction by the US findings. MC and LMA are observed in the cerebral infarction on the acute stage. After 3 months, the area changed to the scar.

**Keywords:** cerebral infarction, B-mode, microcirculation

---

**Poster Session 6**

**Basic research in neurosonology 2**

**P-6-1**

**Ultrasonographic evaluation of the cervical nerve roots in patients with diabetes mellitus**

Daisuke Watanabe¹, Ning Zhang¹, Hidetake Miyazaki², Tatsuya Abe¹, Tetsuo Komori¹
1National Hakone Hospital, department of neurology,
2Chigasaki Municipal Hospital, department of neurology

**Objective:** We investigated the changes of ultrasonographic diameters of cervical nerve roots in patients with diabetic polyneuropathy (DPN).

**Methods:** Fourteen patients with electrophysiologically confirmed DPN (mean ± SD, 63 ± 14 years old) and nine non-neurological patients without diabetes mellitus (66 ± 18 years old) as disease control (DC) were enrolled in this study. Patients with any neurological diseases except DPN, cervical spondylitis, endocrine diseases, liver or renal failure, and alcoholic abuse history were excluded from both groups.

Using 7.5-10MHz linear-array transducer, we obtained longitudinal images of C5, C6 and C7 cervical nerve roots, and measured the diameters of those nerve roots bilaterally at (1) the point where the nerve root was bend along the posterior tubercle, and (2) distal to the tubercle where the nerve root diameter seems to almost stable.

**Results:** There was no difference in the diameter of the cervical nerve root whether patients suffered from DPN or not. (Diameters of DPN at (1) were C5:3.4 ± 0.4mm, C6:4.3 ± 0.6mm, C7:5.5 ± 0.9mm, and those of DC at (1) were C5:3.7 ± 0.6mm, C6:4.4 ± 0.7mm, C7:5.7 ± 0.8mm. Diameters of DPN at (2) were C5:2.5 ± 0.3mm, C6:3.3 ± 0.6mm, C7:4.6 ± 0.7mm, and those of DC at (2) were C5:2.9 ± 0.8mm, C6:3.6 ± 0.7mm, C7:4.8 ± 1.0mm. All diameters of corresponding site DPN and DC showed no statistically significant difference.

**Discussion:** There was no significant change in the diameter of the cervical nerve root of DPN. This might reflect the pathological condition of DPN in which the peripheral nerve was affected from its distal part. To confirm this hypothesis, it would be nec-
necessary to evaluate repeatedly whether the diameter change will occur along to the disease progress.

**Keywords:** diabetic polyneuropathy, cervical nerve root, ultrasonography

---

**P-6-2**  
**Sonographic abnormality in hereditary demyelinating neuropathy**

Naoko Takamatsu, Yuka Terasawa, Hiroyuki Nodera, Yuishin Izumi, Ryuji Kaji  
Department of Neurology Tokushima University Hospital, Tokushima, Japan

**Background:** The genetic abnormality of the PMP22 gene causes two distinct clinical phenotypes: Charcot-Marie-Tooth disease (CMT) 1A by its duplication, and hereditary neuropathy with liability to pressure palsy (HNPP) by its deletion. Detailed sonographic evaluation of these diseases has not been explored.

**Methods:** We performed sonographic evaluation of the peripheral nerves in patients with CMT1A and HNPP with the following measures: CSA = Cross-sectional-area (mm$^2$), FD = Fascicle diameter (mm), WFR = Wrist-to-Forearm Ratio.

**Case 1:** 72-year-old man with slowly progressive weakness and atrophy. Nerve conduction study showed evidence of demyelination. Nerve sonography showed remarkable diffuse swelling in peripheral nerves and nerve roots (elbow portion of the median nerve FD 5.8mm, CSA 30mm$^2$, WFR 1.43). He was diagnosed as CMT1A by genetic testing. **Case 2:** 48 year old female patient. The electrophysiological testing showed multiple focal mononeuropathies in the median and ulnar nerves. Nerve sonography showed heterogeneous swelling (median Forearm :FD 3.5m, CSA11.3 mm$^2$, WFR 1.95). Genetic testing revealed HNPP.

**Conclusions:** Nerve sonography revealed different characteristics in hereditary demyelinating neuropathies, diffuse swelling in CMT1A and focal swelling in HNPP.

**Keywords:** CMT, HNPP, WFR

---

**P-6-4**  
**Examination of the echo intensity by musculoskeletal ultrasound**

Shinichi Matsumoto$^1$, Kaori Tai$^3$, Mayuko Izumi$^1$, Naoko Takamatsu$^1$, Kanako Ichimaru$^1$, Masatoshi Takahashi$^1$  
$^1$Department of Neurology, Shinko Hospital, $^2$Department of Clinical Neuroscience, Institute of Health Biosciences, The University of Tokushima Graduate School, $^3$Physiological laboratory, Department of Clinical Engineering, Shinko hospital, Hyougo, Japan

For the diagnosis of muscle disease, muscle echo is useful. The echo intensity is an important finding in muscle echosonography, but the echo intensity is relative finding that is changes by changing the gain. Examiner diagnosed the intensity relatively by adjusting the brightness of subcutaneous tissue, muscle, bone, and noise in the image. We measured the difference of the intensity of muscle and subcutaneous tissue, muscle and a bone, muscle and a non-signal region, muscle and (a bone + non-signal region), and we considered which method was useful for analysis of the intensity. We captured the 8 muscle of normal subjects while changing the gain as a "very dark image", "dark image", "images of the ordinary", "bright image" and "very bright image". We measured using pixel values of the histogram of the adobe photoshop elements (intensity) a captured image. We made a correlation analysis of the "images of the ordinary" and other image. Correlation was observed in most "muscle - (bone + no-signal)". By evaluating the difference of the intensity of the muscle, and the (bone + no-signal) in a screen, echo intensity may be measured and a muscle disease may be able to be diagnosed.

**Keywords:** histogram, echo intensity, muscle