京都大学大学院医学研究科

てんかん・運動異常生理学講座

Department of Epilepsy, Movement Disorders and Physiology
Kyoto University Graduate School of Medicine

年次報告書 2017, 2018
Annual Report 2017, 2018

2019年3月

＜表紙の言葉＞
表紙のデザインは，波形様の曲線と異なる色彩からなります．脳波の波形と周波数を想像させます．
脳波のサーフィンがもっと上手になることを目指して．

＜Front cover＞
Design of the cover page is the slow waveforms with different colors, which may remind you of brain waveforms and different frequencies.
Hoping to enjoy EEG wave surfing.

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Department of Epilepsy, Movement Disorders and Physiology
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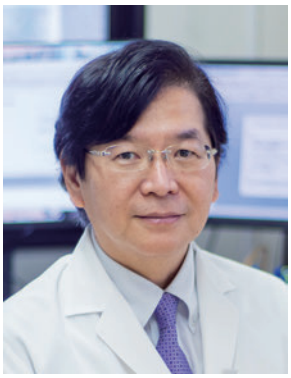
年次報告書 2017, 2018
Annual Report 2017, 2018

2019年 3 月

Preface



Since two years have past after we have issued the third annual reports of the Department of Epilepsy, Movement Disorders and Physiology, Kyoto University Graduate School of Medicine, it is again my great honor and pleasure that we could issue the fourth annual report. We made it for the last two years because we hosted the 51st Annual Congress of the Japan Epilepsy Society (November 3-5, 2017, Kyoto). We appreciate very much all of you who kindly gave the very important comments and suggestion, upon the previous annual reports from other places and fields.

First of all, since the establishment of this department in August 2013, we have been supported, as the endowed department, by GlaxoSmithKline K.K., Niho Kohden Co., Otsuka Pharmaceutical Co., and UCB Japan Co. Ltd. Within the Kyoto University, we greatly appreciate the warmest and continuous support by the Department of Neurology (chaired by Prof. Ryosuke Takahashi), and also by the Departments of Neurosurgery (Prof. Susumu Miyamoto), Psychiatry (Prof. Toshiya Murai), Pediatrics (Prof. Toshio Heike), and Diagnostic Imaging & Nuclear Medicine (Prof. Kaori Togashi).

Based on or in addition to the daily clinical practice for patients with epilepsy and movement disorders in the Kyoto University Hospital, the aim of this Department was originally planned as follows.

1) Clinical Research: To solve pathophysiology of epilepsy and movement disorders, and to develop new treatments that could lead to the advanced medical care. We also aim at standardizing it in clinical practice.
2) Translatable and Translational Research: To promote clinical practice and research of clinical neurophysiology on epilepsy and movement disorders and its clinical application, because basic- and clinical epileptology and movement disorders are very closely related to neurophysiological knowledge and methods.
3) Education: To provide the integrated teaching opportunity for training of physician-scientists, clinical specialists and leaders of related fields internationally. For instance, since 2011, We started the EEG/Epilepsy fellowship program in cooperation with department of Neurology and we also have provided education course in Japan Neurology Society fellowship program (EEG course) since 2017.
4) Industry-academia collaboration under the appropriate COI management.

Upon the completion of the fifth year, we again greatly appreciate all of the Departments of Kyoto University Graduate School of Medicine and all of the Clinical Divisions of the Kyoto University Hospital for their warmest and sincere support to our activity. Without this supports, we could not complete any of them by all means that were reported in this annual report. It was also strongly supported by so many collaborators, researchers and friends in Japan and also internationally.

In this annual report, we are also very pleased to report the outcome and the current state of industry-academia collaboration. We hope that it may represent a positive face of endowment department in general and that it may help industry partners understand the significance of the endowment department in the future plan.

We again tried to summarize what we could do and not, which help us analyze and understand the situation, and then help us improve and modify the current condition, and also start the new concerns. We would greatly appreciate your any feedback to us that is very helpful for our future contribution to the patients close to or distant from us.

At the end of my preface, I thank all of our friends very much whoever kindly worked hard to make and edit this annual report.

December, 2018

With my best wishes,
Akio IKEDA, MD, PhD

Chairman and Professor
Department of Epilepsy, Movement Disorders and Physiology
Kyoto University Graduate School of Medicine

ps: Following the completion of endowment departmenrt in May 2018, Department of Epilepsy, Movement Disorders and Physiology continue as the Industry-Academia Collaboration Course, Kyoto University Graduate School of Medicine.

Index

I Introduction

To begin with

The details of the annual report in each aspect are shown in the following pages as done previously, and thus as the essence of general message directly related to our Department, I am briefly listing them which occurred or appeared in the 2 years from September 2017 to May 2018. I would greatly appreciate your comment and feedback.

1) Evolutional changes in the social sate for epilepsy
2) "Oscillology": the new research field including epilepsy in Japan
3) EEG/ Epilepsy fellowship in Kyoto University Hospital
4) Teaching session
5) Epilepsy should be approached based on the broad scope of general neurology and c"l"inical neuroscience.
6) Innovated, wide-band EEG: "New wine, what you put into new leather bag"
7) Scientific clinical paper is the message to the readers in the future.

1) Epilepsy used to be recognized as a neuropsychiatric disease in Japan historically. As shown by the fact that World Health Assembly closes, passing resolutions on epilepsy.http://www.who.int/mediacentre/news/releases/2015/wha-26-may-2015/en/. It has aided in improving clinical care in epilepsy in Japan as follows. Insurance reimbursement in epilepsy has greatly improved since April 2016 and April 2018, by the National Healthcare System for prolonged-video EEG monitoring, remote reading system of digital EEG and EEG reading service.
   Furthermore, nationwide standardization of epilepsy care in Japan was aimed and promoted by the Ministery of Health and Welfare in last 4 years, and it will be expanded with the close collaboration of Japan Epilepsy Society.

2) With regard to clinical and translatability research, we have been appointed as the member of Grant-in-Aid for Scientific Research on Innovative Areas (Research in a proposed research area): Non-linear Neuro-Oscillology - Towards Integrative Understanding of Human Nature.
   It is most likely that both neuron and glia works very closely, and at least for seizure generation in chronic epilepsy but not acute symptomatic seizures, glia's activity preceded one in epileptic neurons by means of impairment of K^+ homeostatis mechanisms through Kir4.1 channels of the strocytes (http://www.nips.ac.jp/oscillology)

3) We have provided the special EEG/ Epilepsy fellowship as the joint activity with the Department of Neurology (Prof. Takahashi), and 1-3 fellows have been always employed since 2011. We also have provided education course in Japan Neurology Society fellowship program (EEG course) since 2017.As for clinical care in the 4th and 5th year, more than that of the initial 3 year, we tried to contribute to the activity of the Kyoto University Hospital and Graduate School of Medicine, as much as possible, by conducting our initial purposes.

4) We also tried to contribute to the region of Kyoto and Kansai directly by patient care, and also tried to provide the teaching seminars in the field of clinical EEG, clinical epilepsy, and clinical neurophysiology by means of many medical societies, i.e., Japanese Society of Neurology, Japanese Society of Clinical Neurophysiology, and Japanese Society of Epilepsy.

5) Epilepsy should be approached based on the broad scope of general neurology and clinical neuroscience. So-called autoimmune epilepsy is one of the most important topics in clinical care and research in epilepsy, and neuroimmunological approaches are very important from general neurology's point of view. Glia has also been regarded very important for both neurodegenerative disorders and epilepsy. Epilepsy is one of the commonest neurological disorders, and thus approaches to epilepsy in patient's care, research and teaching should be done based on the broad scope of general neurology and clinical neuroscience.

6) "New wine, what you put into new leather bag". Clinical EEG has the history of almost 90 years since the clinical application after the first recording from humans by Prof. Hans Berger in 1920s. In the 21st century, clinical EEG is now in the era of "wide band EEG" to record from extremely low or even DC shifts to extremely fast activity by means of technological advancement, in the daily clinical situation from patents. It could delineate or reflect the activity of glia as well as at least partly action potentials, respectively. It was by no means imagined in the last century as the clinical EEG. By keeping the basic concept that EEG reflects the neuronal (and glial) electrophysiological activity from cellular level to system level, EEG will provide us with essential information by employing the new methods and techniques constantly.
Namely, "New wine (=evolutionally new findings), what you put into new leather bag (=new technology and methodology). " (It may be similar to the Japanese concept hidden in the tradition of "Regular Shrine Removal.")

7) Scientific clinical paper is the message not only to the current readers but also to ones in the future in this planet. We think that sincere, clear documents are the crystalized, real property and will be cited in the future.

For young people, we very much welcome all of you who are interested in this field from any places, and we hope to work and learn together.

In the last, we greatly appreciate the companies who undertstand the aim of this endowment department so as to support for last 5 years.

With my best wishes,

Akio IKEDA, MD, PhD, FACNS

Ⅱ Outline

Funding prospects

Establishment June 1st, 2013
Arrival of staffs August 1st, 2013

Name of the Endowed Department

Department of Epilepsy, Movement of Disorders and Physiology
Kyoto University Graduate School of Medicine

Founding vision

1) As an academic department in the university hospital, we promote researches and clinical applications of clinical neurophysiology, which is essential for elucidating the pathophysiology and developing the treatment of clinical epileptology.
2) It is our mission to elucidate the pathophysiology and develop the treatment of epilepsy and movement disorders so as to develop the highly advanced medicine for its application to clinical practice. We also make best efforts to offer opportunities of trainings and educations to young physicians both from Japan and abroad to foster the specialists and physician-scientists in the field of epilepsy.

Research vision

In close collaboration with the Department of Neurology, we aim at achieving the following projects in a comprehensive, efficient and multidisciplinary manner.

1. Development of medical devices for wide-band EEG recording&analysis, and its application to elucidation of epileptogenicity
2. Promotion of epilepsy surgery and research on higher brain functions&its plasticity under epileptic conditions
3. Combined imaging and neurphysiological researches on the pathophysiology of the epileptic focus
4. Research on the pathophysiology and treatment of movement disorders
5. iPS (induced pluripotent stem) cell research and animal model research on epileptogenesis
6. Establishment of the training programs for the advanced specialists in the related fields
7. Promote collaborative researches with basic and mathematical scientists to understand neural oscillations underlying both physiological brain functions and pathology

Companies of endowment（in alphabetical order）

GlaxoSmithKline K.K.
NIHON KOHDEN CORPORATION
Otsuka Pharmaceutical Co., Ltd.
UCB Japan Co., Ltd.

Contact address

URL: http://epilepsy.med.kyoto-u.ac.jp
E-mail: epilepsy@kuhp.kyoto-u.ac.jp (Secretary)
Address: Shogoin, Sakyo-ku, Kyoto, 606-8507, JAPAN
TEL: (+81)-75-751-3662
FAX: (+81)-75-751-3663

Members of this Department and Affiliated Persons (Jun. 2016 - May 2018)

<Members of Department of Epilepsy, Movement Disorders and Physiology>

Professor: Akio Ikeda, M.D., Ph.D.
Associate Professor: Riki Matsumoto, M.D., Ph.D. (- Jul. 2016)
Assistant Professor: Akihiro Shimotake, M.D., Ph.D. (Nov. 2016 -)
Secretary: Miki Watanabe
Visiting Scientist: Tomoyuki Fumuro, Ph.D. (Dept. of Medical Technology and Sciences, School of Health Sciences at Fukuoka, International University of Health and Welfare)
Morito Inouchi, M.D., Ph.D. (Dept. of Neurology, Kyoto City Hospital, Apr. 2017 -)
Research support personnel: Takeshi Inoue M.D. (Dept. of Pediatric Neurology, Osaka city general hospital)

<Affiliated members from Department of Neurology>

Associate Professor: Riki Matsumoto, M.D., Ph.D. (Aug. 2016 -)
Assistant Professor: Akihiro Shimotake, M.D., Ph.D. (- Oct. 2016)
Katsuya Kobayashi , M.D., Ph.D.

Graduate Students (Doctoral course):

Makiko Ota, M.D. (- Mar. 2017)
Kei Sato, M.D. (- Mar. 2017)
Hirofumi Takeyama, M.D. (- Mar. 2017)
Masato Kinboshi, M.D., Ph.D.
(from Wakayama Medical University, - Mar. 2018)
Masako Daifu-Kobayashi, M.D. (- Mar. 2018)
Jumpei Togawa, M.D. (- Mar. 2018)
Mitsuyoshi Nakatani, M.D.
(from Juntendo University School of Medicine, - Mar. 2018)
Tomohiko Murai, M.D. (- Mar. 2018)
Kenji Yoshinaga, M.D. (- Mar. 2018)
Shuichiro Neshige, M.D. (from Hiroshima University School of Medicine, Apr. 2015 -)
Kazuaki Sato, M.D. (Apr. 2015 -)
Kosuke Tanioka, M.D. (Apr. 2015 -)
Masaya Togo, M.D. (Apr. 2015 -)
Mitsuhiro Sakamoto, M.D. (Apr. 2015 -)
Kazuki Oi, M.D. (Apr. 2017 -)
Mayumi Otani, M.D. (Apr. 2017 -)
Shunsuke Kajikawa, M.D. (Apr. 2017 -)
Shamima Sultana (Apr. 2017 -)
Tadashi Okada, M.D. (Apr. 2018 -)
Miwa Takatani, M.D. (Apr. 2018 -)
Maya Tojima, M.D. (Apr. 2018 -)

Graduate Student (Master's course): Shamima Sultana (- Mar. 2017)

EEG/Epilepsy fellowship:

Daiki Fujii, M.D. (Feb. 2016 - Mar. 2017)
Masayuki Honda, M.D., Ph.D. (Apr. 2016 - Mar. 2018)
Haruo Yamanaka, M.D. (Jan. 2017 - Mar. 2017)
Toshikazu Hamaguchi, M.D. (Apl. 2017 -)
Nobutaka Mukae, M.D., Ph.D. (Jun. 2017 - Jul. 2017)
Norihiro Muraoka, M.D., Ph.D. (Oct. 2017 - Mar. 2018)
Tomoaki Taguchi, M.D. (Apr. 2018 - Jun. 2018)

Research student and undergraduate student:

Borgil Bayasgalan, M.D., Ph.D. (Apr. 2016 - Mar. 2017)
Ryosuke Kurauchi (Department of Human Health Sciences, Apr. 2016 - Mar. 2017)
Makiko Ota, M.D. (Apr. 2017 - Mar. 2018)
Kei Sato, M.D. (Dept. of Neurology, Uji Hospital, Apr. 2017 -)
Mitsuyoshi Nakatani, M.D. (from Juntendo University School of Medicine, Apr. 2018 -)
Masako Daifu-Kobayashi, M.D. (Apr. 2018 -)
Yumi Kanesaki (Utano National Hospital, Apr. 2018 -)
Ichiro Sasaki (Kobe City Medical Center General Hospital, Nov. 2016 -)

Medical assistant technician: Makiko Matsushita (Apr. 2016 - Mar. 2017)
Saho Takasaki (Dept. of Human Health Sciences, Apr. 2017 -)
Kana Furuichi (Dept. of Human Health Sciences, Apr. 2017 -)

<Affiliated members>

Department of Neurosurgery

Senior Lecturer: Kazumichi Yoshida, M.D., Ph.D.
Assistant Professor: Takayuki Kikuchi, M.D., Ph.D.
Yukihiro Yamao, M.D., Ph.D. (Jan. 2017 -)

Research and Educational Unit of Leaders for Integrated Medical System

Program-specific Associate Professor: Masao Matsuhashi, M.D., Ph.D.

Department of Clinical Laboratory Medicine

Senior Lecturer: Takefumi Hitomi, M.D., Ph.D. (promoted from Assistant Professor, Aug. 2017 -)
Medical Staff: Masayuki Honda, M.D., Ph.D. (Apr. 2018 -)

Department of Respiratory Care and Sleep Control Medicine

Assistant Professor: Morito Inouchi, M.D., Ph.D. (- Mar. 2017)
Hirofumi Takeyama, M.D. (Apr. 2017 -)

III Activity report

Research activities（～ May, 2018）

Our main goal is to solve so-called "clinical questions", which have been raised in the daily clinical activity, and have remained unsolved yet.

Based on the concept of systems neuroscience, by means of established and newly developed various methods, many clinical and basic researches are conducted as follows.

KEY WORDS

General key words: epilepsy, epilepsy surgery, higher cortical function (motor control, praxis, language, semantic cognition, vision, will), Bereitscheftspotential (BP), cortico-cortical network, movement disorders, sleep disorders, autoimmune epilepsy

Unique key words: ictal DC shift, high frequency oscillation (HFO), cortico-cortical evoked potential (CCEP), cortical tremor, ictal apraxia, ictal paresis, wide-band EEG

1）Pathophysiology of medically intractable epilepsy and its treatment

a）Unraveling pathophysiology for intractable partial epilepsy

Epilepsy surgery has been established as an option for treatment of intractable partial epilepsy. The epileptogenic lesions, such as hippocampal sclerosis, cavernous angioma, and brain tumor, are the most common candidates for the one-stage surgery. It is still a challenge to localize the epileptic focus in 'MRI-negative' patients, who show no (apparent) lesion by clinical MRI studies. We have extensively made multidisciplinary approaches with video-EEG monitoring, MEG and FDG-PET to 'visualize' the epileptic focus in these MRI-negative patients for possible treatment with epilepsy surgery. Especially in the MRI-negative cases, we occasionally need invasive evaluation with intracranial electrodes to precisely delineate the epileptic focus and map the eloquent cortices at and around the epileptic focus. In addition to the conventional frequency band (Berger rhythm: 0.3-70 Hz), advancement in medical engineering has enabled us to record electrocorticogram with a broader frequency band (wide-band EEG), ranging from direct current shifts (DC shifts) to high frequency oscillations (HFOs). In our recent report, several features of ictal DC shifts and HFOs were extracted in 16 patients who underwent chronic intracranial recording as follows; 1) high occurrence rates of DC shifts during ictal period, 2) DC shifts preceded HFOs with statistically significance in most patients, 3) DC shifts and HFOs were observed in more restricted area than conventional ictal pattern, 4) higher occurrence rate in focal cortical dysplasia than hippocampal sclerosis (Kanazawa et al., 2014). These findings were reproducible in the subsequent multicenter collaboration study. Furthermore, location with most clear ictal DC shifts and HFOs were significantly associated with a good post-operative outcome in comparison with the region without those ictal activities. These results suggested that clinical significance of wide-band EEG to delineate seizure focus.

In these respects, collaborative studies with Osaka University of Pharmaceutical Sciences is ongoing to elucidate generation mechanisms of DC shifts and HFOs by means of wide-band EEG analysis and multi-unit recording in epilepsy model animals. We evaluated the effects of Kir4.1 inhibition (blockade and knockdown) on expression of brain-derived neurotrophic factor (BDNF), a key modulator of epileptogenesis, in the primary cultures of mouse astrocytes. This evaluation demonstrated that inhibition of Kir4.1 channels facilitates BDNF expression in astrocytes, which may be linked to the development of epilepsy and other neuropsychiatric disorders (Kinboshi et al., 2017). Recently, in the animal model (Pilocarpine-induced epilepsy rats) of drug-induced epilepsy and the model (Lgi1 mutant rat) of autosomal dominant lateral temporal lobe epilepsy, we demonstrated that the change in expression of Kir4.1 channel in astrocytes is associated with epileptogenesis. Furthermore, EEG for these epilepsy model animals succeeded in recording ictal DC shift and HFOs. We are now trying to examine the role of glial cells in epilepsy pathology.

It has been known that epileptic discharges can spread to the other areas through intercortical networks. Thus, in addition to epileptic foci, it would be important to understand an epileptic network formulated by epileptic foci, propagating areas and connecting white matters. MRI tractography is a method evaluating anatomical networks. By combination with MR tractography and FDG-PET, we delineated decreased integrity of seizure propagation tracts in MTLE patients (Imamura et al., 2016). We recruited 18 patients with MTLE and 18 healthy subjects. In the patients, the remote functional deficit zone was defined using FDG-PET as an extratemporal region showing glucose hypometabolism. Based on the diffusion MRI tractography in 18 patients with MTLE and 18 healthy subjects, a decrease in fractional anisotropy was found in MTLE patients compared with healthy subjects in all tracts, but propagation tracts showed a more significant decrease in fractional anisotropy than two control tracts, demonstrating that epileptic activity impairs not only the focus, but also the whole network (the focus - the propagation tract - the remote functional deficit zone). The present findings demonstrate that epileptic activity impairs not only the focus, but also the whole network (the focus - the propagation tract - the remote functional deficit zone).

Cortico-cortical evoked potential, CCEP, is an in vivo electrical tract tracing method for presurgical evaluation, developed in Cleveland Clinic and Kyoto University (Matsumoto et al., Brain 2004). By means of subdural electrodes, electrical pulses (0.3-ms duration, frequency of 1 Hz, alternating polarity, 1-10 mA) are directly delivered to a part of the cortices, and CCEPs are obtained from adjacent and remote cortical regions by averaging the electrocorticogram time-locked to the stimulus onset. It promises to refine our understanding of surgical candidacy, first through a more precise and tailored evaluation of the seizure network in each individual patient, and second through greater understanding of the functional systems of the brain involved. By developing the methodology of CCEP, we proposed high frequency activities (HFAs) induced by single-pulse electrical stimulation (SPES) as an index that reflects cortical excitability. We applied the stimulus-induced HFAs to evaluate its utility as a surrogate marker of epileptogenicity. We recruited patients with intractable partial epilepsy who underwent chronic subdural electrode implantation. Compared with the cortices outside the epileptic focus, those within the focus showed significantly more intense increase of HFAs (<50 ms after SPES). We clarified that stimulus-induced HFAs would be used as a possible interictal biomarker of epileptogenicity (Kobayashi et al., 2017).

b) Unraveling pathophysiology and treatment for various epilepsy syndrome

Even in the 21st century, electroencephalography (EEG) remains essential in the diagnosis of "epileptogenicity". Simultaneous recording of EEG and fMRI (EEG-fMRI) is a new technique that takes advantages of both modalities and complements each other to delineate both the cortical and subcortical structures related with epileptic activities. We for the first time introduced this technique to Japan to investigate the epileptic network and underlying pathophysiology in various types of epileptic syndromes such as praxis-induced epilepsy and hypothalamic hamartoma (HH). Recently, we demonstrated epileptic networks of HH by means of EEG-fMRI (Usami et al., 2016). Based on the results, hypothalamus, brainstem, cerebellum and cerebral cortices would be a network generating epileptic activities, and default mode network (DMN) and hippocampi might be relevant to loss of awareness during seizures and epileptic encephalopathy in HH patients. Furthermore, by using the resting-state fMRI method at rest, we are pursuing collaborative research to analyze functional networks in the brain that change before and after stereotaxic thermal clotting of hamartoma (Togawa et. al., 51st Annual Meeting of the Japan Epilepsy Society). There is a tendency that the functional binding of the anterior cingulate gyrus to the hamartoma declines after the stereotaxic thermal coagulation operation in comparison with that before surgery. Thus, it is suggested that blocking of pathologic networks by surgery may lead to a decrease in epileptic seizures and loss of seizure.

Recently the role of autoimmunity has been highlighted for a subset of encephalitis and epileptic seizures. Nowadays, high-resolution MRI can depict subtle structural changes in the medial temporal lobe, such as hippocampus and amygdala, which are often the main inflammatory foci in autoimmune limbic encephalitis. By means of comprehensive study such as video-EEG monitoring (VEEG), neuropsychological test, FDG-PET and MRI, we have revealed the smoldering nature of the autoimmune limbic encephalitis. We have been utilizing multidisciplinary approach (VEEG, FDG-PET and 3T MRI) for offering tailor-made immunotherapy for patients with autoimmune

epilepsy. Additionally, we reported that autoimmune mechanism could underlie in an epileptic patient with atypical clinical picture (triple pathology in a patient with parietal tumor) (Matsumoto et al., 2015). We examined the long-term course (86-103 months) of anti-VGKC antibody positive autoimmune encephalitis. We measured the volume of the amygdala, hippocampus and whole brain, demonstrating that 1) the amygdala body tends to be swollen even in the chronic phase, 2) the increase during the course can be a marker of relapse of inflammation, and 3) not only the hippocampus but also the cerebral atrophy will proceed unless adequate immunotherapy is performed (Honda et al., 31st International Congress of Clinical Neurophysiology). Based on these findings, we attempt to make diagnostic criteria of autoimmune epilepsy, based on both clinical picture and various examinations (Sakamoto et al., 23th World Congress of Neurology).

We started conducting collaborative researches in epilepsy by means of iPS cells with Prof. Haruhisa Inoue (Center for iPS Cell Research and Application: CiRA).

Progressive myoclonus epilepsy (PME) is one of the epilepsy syndromes characterized by epileptic seizures and other neurological symptoms such as cortical myoclonus, cerebellar ataxia, and cognitive impairment. The most common form of PME is Unverricht-Lundborg disease (ULD). We reported ULD cases in Japan, in some of which the development of symptoms and increase of SEP amplitude became very subtle for long-term follow-up. The effectiveness of the Perampanel (PER) on cortical myoclonus in patients with PME has been drawing attention in recent years, however its mechanism has not been clear yet. We retrospectively investigated the change of the somatosensory evoked potential (SEP) before and after the PER treatment in cases with epileptic seizures and cortical myoclonus. Among these evaluated cases, patients with a good therapeutic response showed 1) the decrement of giant SEP which reflects the cortical excitability, and 2) prolongation of SEP latencies (Oi et al., 23 th World Congress of Neurology).

Multicenter collaborative study with Kinki University and Hiroshima University reached to the milestone. We compared scalp-recorded slow cortical potentials (SCPs) during stimulation period with the inter-stimulation interval respectively from 5 electrodes in patients undergoing VNS therapy. The comparison showed that utilization of EEG with a long TC (10 s) revealed positive SCP shifts during VNS in good responders, suggesting that VNS enhances suppressive output from the thalamus and strengthens the function to suppress the excitability of the cerebral cortex. A positive shift of SCP recorded by using a TC of 10 s could be a surrogate marker for VNS response (Borgil et al.,

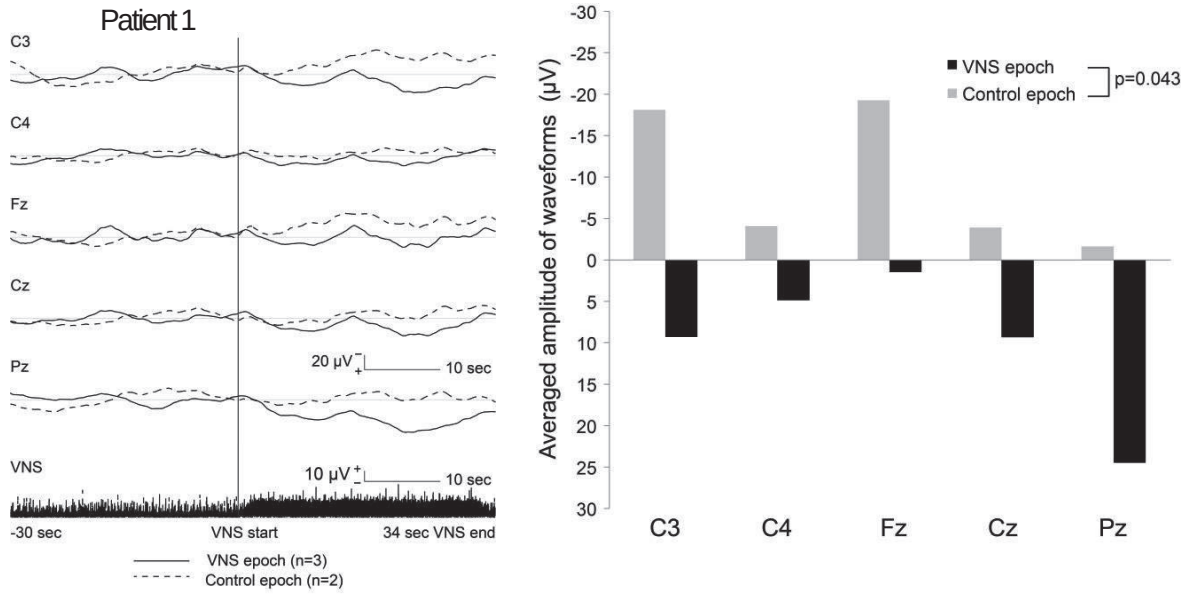


Figure 1. Modified from Borgil et al, 2017. Left: Averaged EEG waveforms of the VNS epoch and control epoch. The EEG showed positive polarity of SCP shifts during stimulation. Right: Quantification of waveforms at 5 electrodes during stimulation of VNS epoch and no stimulation of control epoch.

2017).

In patient with hypoxic encephalopathy in which electroencephalogram findings play an important role in treatment and prognostic evaluation, the activity of 0.08 to 0.5 Hz which can be measured with a time constant of 2 seconds was defined as short infra slow activity (SISA). We reported that SISA is superimposed on the Burst phase of the Burst - suppression pattern, and is significantly associated with acute symptomatic seizures and myoclonus after resuscitation (Togo et al., 2018).

c) Advanced EEG analysis

EEG now has a history of more than 80 years for evaluation of brain functions and diagnosis of brain diseases, ranging from brain death, coma to epilepsy. Medico-engineering collaboration between Prof. Shibasaki's group (Kyoto University School of Medicine, Neurology, Human Brain Research Center) and Prof. Nakamura's group (Saga University, Faculty of Science and Engineering) has been done to develop the automatic EEG interpretation system, and it is currently under clinical investigation. Now we developed a remote EEG viewing system in collaboration with the department of Neurology of Kobe City Medical Center General Hospital and Takeda General Hospital, and Nihon Kohden, aiming at improvement in quality about clinical practice of epilepsy and a close intermural link.

Based on the long-term video-EEG monitoring data, the morphology of the epileptogenic discharge was analyzed. Epileptic discharges recognized in epileptic patients revealed that the slow wave component of the spike was significantly higher than those in the transient sharp (which is regarded as a normal variant). This finding suggested the usefulness of EEG in determining epileptogenicity (Shamima et. al., 51st Annual Meeting of the Japan Epilepsy Society). In addition, we started a collaborative study with National Cerebral and Cardiovascular Center in order to establish the diagnostic criteria and treatment for the post-stroke epilepsy patients.

2) Mapping higher functions/network and elucidating its functional alteration under pathological condition

In epilepsy surgery, it is important to map cortical functions to preserve eloquent cortices in addition to the localization of the epileptic focus. Therefore, we need to perform comprehensive 'system mapping' to help neurosurgeons to make strategy of surgery for individual patients. We have made vigorous attempts at developing various techniques for mapping higher cortical functions (e.g., language, motor control etc.) and their network for clinical application.

Functional neuroimaging tells us if specific brain regions are active during certain tasks, but activation by itself does not demonstrate the necessity of those areas. In contrast, electrical cortical stimulation, a gold standard method since mid-20th century, can delineate the cortex responsible for a particular task by making functional impairment. The functional interference is temporary (～5 s), discretely focal (～1 cm^2), and in sharp contrast to chronic stroke lesions that are relatively large and usually associated with cortical plastic compensation.

However, high frequency electrical stimulation often results in afterdischarges that delay functional mapping and harbor a risk of seizure induction. Recent technical advances have enabled us to record the cortical activities relevant to higher cortical functions with wideband EEG technology - from infraslow to high gamma activities. In our institute, in addition to the gold standard method of high frequency electrical stimulation, we perform comprehensive mapping of higher cortical functions by recording epicortical infraslow and high frequency oscillation/activity during motor or cognitive tasks.

We assessed the feasibility of multi-component electrocorticography (ECoG)-based mapping using 'wide-spectrum, intrinsic-brain activities for identifying the primary sensori-motor area (S1-M1) for non-stimulus, less invasive functional mapping strategy, alternative to electrical cortical stimulation (ECS). We evaluated 14 epilepsy patients with subdural electrodes implantation and performed multicomponent, ECoG-based mapping involving combined analyses of the single components: movement-related cortical potential (MRCP), event-related synchronization (ERS), and event-related de-synchronization (ERD) to identify the S1-M1. As conclusions, wide-spectrum, multi-component ECoG-based mapping is feasible, having high sensitivity/ specificity relative to ECS to identify the S1-M1. This non-stimulus, less

invasive mapping strategy can be the alternative to electrical cortical stimulation (ECS). (Fig.2) (Neshige et al., 2018)

We incorporate cortico-cortical evoked potentials (CCEPs) to probe inter-areal functional connectivity in order to perform 'system mapping'. CCEP is an in vivo electrical tract tracing method developed in Cleveland and Kyoto (Matsumoto et al., 2004). Single electrical stimulation (1 Hz) is applied to a part of the cortices and cortical evoked potentials, i.e., CCEPs, were recorded from adjacent and remote cortical activities through cortico-cortical connections. With this CCEP method, we can probe cortico-cortical networks involved in functional brain systems and seizure network in each individual patient. Furthermore, by gathering data of cortical functions and networks from many patients in various physiological and pathological states and analyzing them as a group, we attempt to feedback this valuable information into the system neuroscience by providing functional/connectivity references for non-invasive researches.

We can also use induced evoked potential (CCEP) and high frequency activities (HFA) as a dynamic marker of cortical connectivity and excitability since it can "snapshot" the connectivity and excitability within 20-30 trials (< 1 min). We applied this method to awake and sleep cycle and found that cortical connectivity and excitability are different between wakefulness and non-REM (rapid eye movement) sleep. We analyzed CCEP-related HGA that are recorded from adjacent and remote cortical areas as a proxy of cortical excitability. We reported that the excitability changes across sleep stages and that the intensity of suppression that follows excitation was potentiated during non-REM sleep, with REM sleep being an intermediate state of wakefulness and non-REM sleep (Usami K, et al., 2015, Hum Brain Mapp). In the present study, we reanalyzed the data from the previous study to further compare the difference among

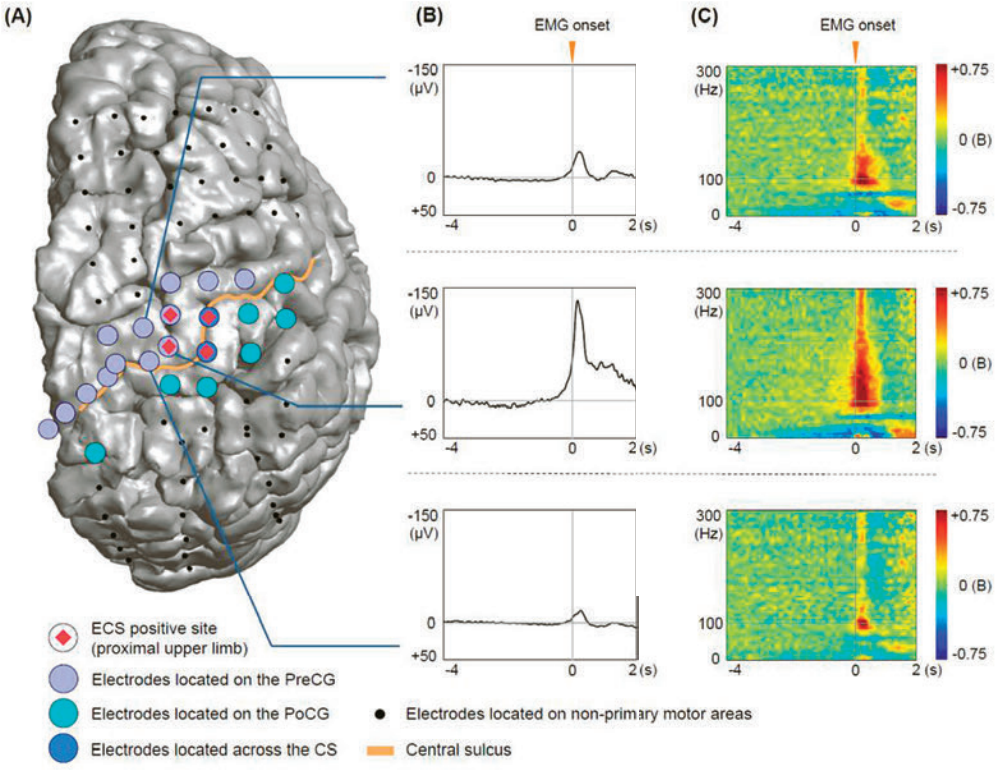


Figure 2. Multi-component electrocorticography (ECoG)-based mapping and method for measuring movement-related cortical potential (MRCP) and event-related synchronization/de-synchronization (ERS/ERD). (A) Anatomical localization of subdural electrodes in the right central region in a representative patient. The electrodes are located on areas corresponding to the primary motor cortex and the primary sensory cortex. (B) Representative data of averaged slow cortical potential (MRCP) and (C) time-frequency representation for power changes (ERS/ERD) associated with shoulder movements contralateral to the implanted electrodes showed spatial concordance with cortical stimulation-based map.

CCEP during wakefulness, the phasic REM (the period when the bursts of REMs are seen) and tonic REM periods (the remaining period of REM sleep). We revealed, for the first time, that suppression is attenuated during phasic REM, suggesting that cortical excitability transiently approaches wakefulness (Fig.3) (Usami K, et al., 2017, SLEEP). We argued that the potentiated suppression to external input during sleep might prohibit further signal processing within the same cortical region and integration of information among cortical areas, leading to a state of unconsciousness in the previous study. However, it remained unknown why humans have more dreams during phasic REM period. Our present data could be a key to reveal the mystery of dreaming.

We incorporate cortico-cortical evoked potentials (CCEPs) to probe inter-areal functional connectivity in order to perform 'system mapping.' For example, in close collaboration with the Department of Neurosurgery, we have applied CCEP intraoperatively to monitor the integrity of the dorsal language pathway. In this approach, we first define the anterior perisylvian language area (AL) according to presurgical anatomical/functional neuroimaging findings and CCEP connectivity patterns under general anesthesia. We then monitor the integrity of the language network by stimulating AL and by recording CCEPs from the posterior perisylvian language area consecutively during resection of the tumor in the vicinity of the arcuate fasciculus (Yamao et al., 2017).

We investigated the neuro-feedback during the subdural electrode implantation. The neuro-feedback (NFB) is Neuro-feedback (NFB) therapy, one of the non-drug therapy for epilepsy, is aiming at suppression of seizures by autonomously displacing the real-time slow potential (SP) measured from the scalp electrodes to positivity. However, the SP from scalp electrode is susceptible to artifacts, especially the galvanic skin response. Therefore, there was a doubt as to whether the SP originating from the brain could be recorded at scalp electrodes. In our study, we recorded the SP from the subdural electrodes and scalp electrode simultaneously, from the patients with drug-resistant focal epilepsy who underwent extraoperative subdural electrocorticography recording for presurgical evaluation. The coherence value of the SP below 0.5 Hz during the measurement of NFB was calculated. As a result, we showed that scalp-recorded SPs from the vertex area primarily reflect the cortical activity of high lateral convexity.

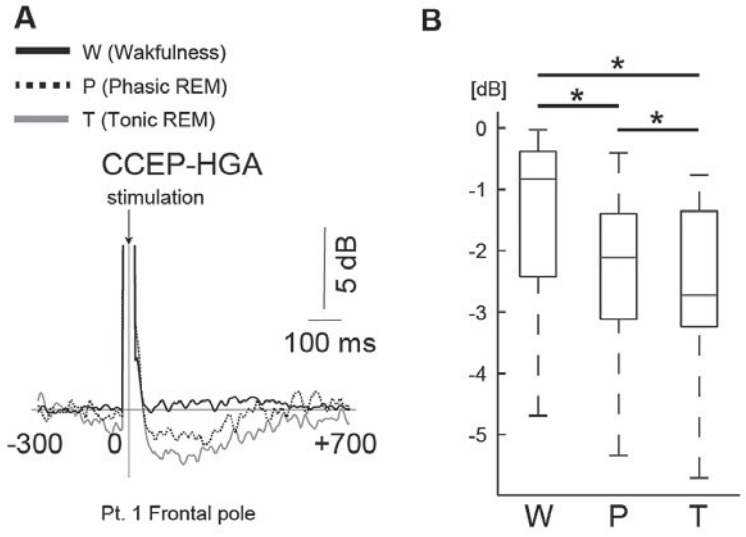


Figure 3. The difference of CCEP-HGA among wakefulness, phasic, and tonic REM. (A) An example of representative CCEP-related HGA across sleep stages from one electrode of one patient. Note that the phasic REM is closer to wakefulness than tonic REM in terms of negative deflection of CCEP-HGA. (B) Statistical analysis for CCEP indices of analysis sites (n = 16) comparing wakefulness, phasic REM, and tonic REM. The values of the minimum of CCEP-HGA are indicated by box plots (the central line in the box indicates the median of the data and the lower and upper boundaries of the box are at the 25% and 75% quantiles of the data). The vertical lines (whiskers) extend to the most extreme data point within 1.5 times the height of the central box. *Statistically significant at $p < .05$, Wilcoxon signed-rank test. Multiple comparisons were all corrected by Holm's method. Cited with modification from Figure 2 in Usami K, et al., 2017, SLEEP.

By contrast, the distantly positioned electrodes, such as those in the basal temporal and basal frontal regions, revealed comparatively lower coherence values. In this way, since the coherence values of SP were inversely proportional to the distance between the electrodes, which showed that SP from scalp vertex derived from the brain itself and reflects the excitability of the brain (Fumuro et al., 2018).

We have demonstrated the central mechanisms and functional alteration under pathological condition relevant to i) the motor control (negative motor phenomena, praxis, reaching, conflict processing and response inhibition), ii) language (dorsal and ventral language networks with emphasis on semantic cognition) and iii) visual functions (retinotopic mapping by functional MRI), combined with non-invasive evaluation (functional MRI, diffusion tractography, MEG, neuropsychology). Additionally, we are now tackling with decoding of complex neural signals during various tasks in cooperation with seasoned researchers in and out of the Kyoto University (Graduate School of Informatics, Dr. Satoshi Tsujimoto; Advanced Telecommunications Research Institute International, Dr. Rieko Osu; School of Psychological Sciences, the University of Manchester, Prof. Matthew Lambon-Ralph). Finally, we are pleased to announce that our group (A03 "the Direct Recording of Human Neural Oscillations", Prof. Ikeda as PI) engages in the national research group of "Neuro-Oscillology" which is funded by Grant-in-Aid for Scientific Research on Innovative Areas from the Ministry of Education, Culture, Sports, Science and Technology (MEXT). We also have taken part in the 'Embodied-Brain Systems Science' funded by another grant from MEXT (A03-4, Dr. Riki Matsumoto as PI), in order to reveal the motor control and the mechanism of body representations especially in the fronto-parietal network.

3) Pathogenesis of movement disorders and its treatment

We have investigated movement disorders, mainly myoclonus and myoclonus epilepsy, by way of epidemiological, genetic and electrophysiological methods. BAFME (benign adult onset familial myoclonus epilepsy) has been investigated mainly in Japan and European countries for 20 years. The clinical pictures are as follows: i) adult onset, ii) autosomal dominant (unknown causative gene), iii) cortical (myoclonic) tremor (tremulous myoclonus), iv) infrequent generalized seizure, v) cortical reflex myoclonus disclosed by electrophysiological study. We have also been studying BAFME since it was first reported in 1990. As its name suggests, BAFME was considered to present no progression and good prognosis. However, cortical myoclonic tremor has been proved to worsen with aging. Recently, we demonstrated slow progression of the disease, based on the electrophysiological evidence. Namely, the amplitude of somatosensory evoked potential, reflecting the cortical excitability in the primary sensori-motor cortices, more exaggerated with aging in BAFME patients than normal volunteers. We also demonstrated clinical anticipation in BAFME, in which the onset of generalized seizure and cortical (myoclonic) tremor became earlier in the next generation. The anticipation in BAFME was more apparent in patients with maternal transmission. By comparing the EEG posterior dominant rhythms (PDRs) between patients with BAFME and age-matched control subjects, we showed mild diffuse encephalopathy in BAFME. By comparing awake and sleep EEG, epileptiform discharges were significantly more frequent during awake period than those during sleep, which indicated a reduction in cortical irritability during sleep period. Unverricht-Lundborg disease (ULD) showed a similar tendency, and thus BAFME and ULD may share a similar pathological mechanism of genesis of cortical irritability from the view point of vigilance change (in submission). By means of cortico-muscular coherence, we clarified that hyperexcitability of primary sensorimotor cortex and the subcortical structures such as basal ganglia and cerebellum would be involved in the generator mechanisms of cortical tremor in BAFME (in preparation). Based on these findings, multi-institutional study supervised by Dr. Shoji Tsuji of Tokyo University revealed the causative gene of BAFME (Ishiura et al., 2018). In addition, the nationwide questionnaire for neurologists and epileptologists in Japan revealed that BAFME patients were found diffusely without regional accumulation. The further survey based on the detailed clinical information of about 100 BAFME patients clarify the pathophysiology of BAFME in Japan (Kobayashi et al., 2018).

Besides epilepsy patients, we reported a case of elderly woman with exaggerated startle reflex and unconsciousness drop attack including the analysis of electromyography polygraph (Neshige et al., 2016). (Maya Tojima, Kazuki Oi, Shuichiro Neshige, Katsuya Kobayashi, Takefumi Hitomi)

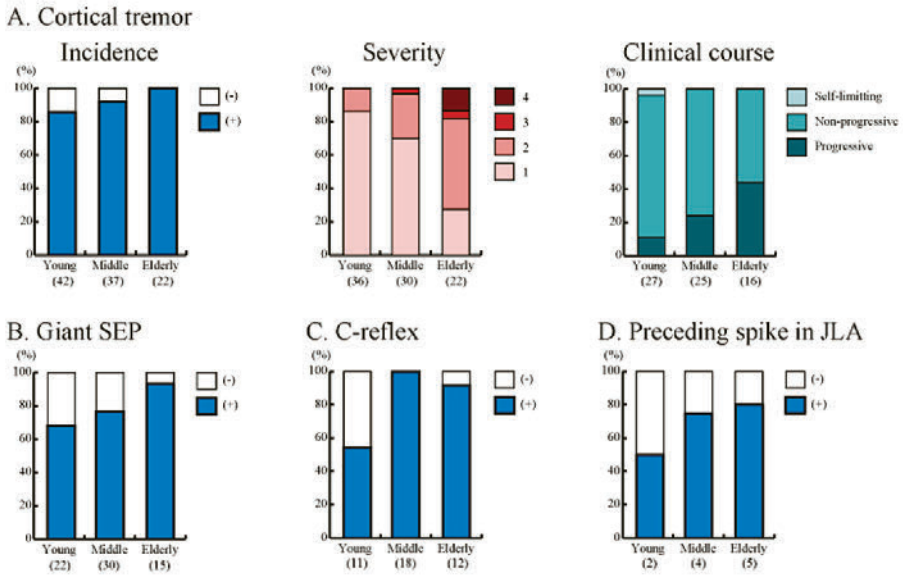


Figure 4. Correlation between age and cortical excitability in benign adult familial myoclonus epilepsy (BAFME). In the nationwide survey of 101 BAFME patients, the clinical course of cortical tremor showed progression in 11.1% (3/27), 24.0% (6/25), and 43.8% (7/16) for the young (<50 years), middle-aged (50-70 years), and elderly group (>70 years), respectively. The middle-aged and elderly groups showed a higher degree of cortical tremor, suggesting a progressive tendency for this symptom (A). In the young, the middle-aged, and the elderly groups, the positive rates on neurophysiological examinations were 68.2% (15/22), 76.7% (23/30), and 93.3% (14/15) for giant somatosensory evoked potential (SEP), 54.5% (6/11), 100% (18/18), and 91.7 (11/12) for C-reflex, and 50.0% (1/2), 75.0% (3/4), and 80.0% (4/5) for a preceding spike in jerk-locked back averaging (JLA), respectively (B-D). The positive rates (suggesting cortical hyperexcitability) were higher in the middle-aged and elderly groups than those in the young group (modified from Kobayashi et al., 2018).

4) Mathematical model approach to the mechanism of epileptogenesis and higher brain function

Digital EEG enables recording of large number of channels and wide bandwidth data, and advanced computational science allows various analysis beyond visual inspection, such as localization of epileptic foci, functional brain mapping, brain-computer interface, and so on. In this field, we work in close collaboration with researchers of basic and theoretical sciences. Supported by Grant-in-Aid for Scientific Research on Innovative Areas (Non-linear Neuro-oscillology: Towards Integrative Understanding of Human Nature) from the Ministry of Education, Culture, Sports, Science and Technology, Japan, we used database to share tools and wave data among researchers and held following activities to promote such collaboration.

- 2017/1/7 Hands-on seminar
- 2017/6/15 Special lecture: "Epilepsy: complexity is the solution" (Prof. Christophe Bernard, Aix-Marseille Université)
- 2017/11/2, 5 Pre-congress hand-on and post-congress seminar (AEEE symposium) at the 51st Congress of The Japan Epilepsy Society

Individual collaborative research projects are as follows:

- Power spectral and chaotic time-series analysis of epileptic seizure and interictal intracranial EEG data with Dr. Namiki of Hokkaido University and Dr. Tsuda of Chubu University
- Building and validating mathematical neuronal model with glial component, theoretical approach to prevention and abortion of epileptic seizure, with Dr. Ueda of Toyama University
- Pathophyiology modeling of epilepsy with Prof. Bernard, Aix-Marseille Université
- Analysis of cerebral motor control mechanism by neural decoding of corticography data with Dr. Osu of ATR and Dr. Mima of Ritsumeikan University

5）Collaborators

We have been collaborating closely with the Departments that officially support our department. Other collaborators are listed below.

[Overseas]
Dr. Stéphanie Baulac, Ph.D.
Affiliation: Institut du Cerveau et de la Moelle épinière (ICM), Epilepsy Unit
Position: Research Director

Dr. Christophe Bernard, Ph.D.
Affiliation: INS - Institut de Neurosciences des Systèmes, UMR INSERM 1106, Aix-Marseille Université
Position: Team leader

Prof. Marco Catani, M.D., Ph.D.
Affiliation: Natbrain lab, Department of Forensic and Neurodevelopmental Sciences, Institute of Psychiatry, King's College London
Position: Head of the Natbrainlab, Clinical Senior Lecturer and Honorary Consultant Psychiatrist

Prof. Nathan Earl Crone, M.D.
Affiliation: Department of Neurology, Johns Hopkins University School of Medicine
Position: Professor

Prof. Mattew A. Lambon-Ralph, FRCSLT (hons), FBPsS
Affiliation: School of Social Sciences, Manchester Institute for Collaborative Research on Ageing, The University of Manchester
Position: Professor

Michel Le Van Quyen
Affiliation: Institut du Cerveau et de la Moelle Epinière, Hôpital de la Pitié-Salpêtrière
Position: Researcher

Dr. Dileep R. Nair, M.D.
Affiliation: Epilepsy Center, Cleveland Clinic
Position: The Section Head of Adult Epilepsy and Director of Intraoperative Neurophysiologic monitoring

Dr. Marco de Curtis, M.D.
Affiliation: Fondazione IRCCS Istituto Neurologico Carlo Besta
Position: Head of Epileptology and Experimental Neurophysiology Unit, Head of Pre-clinical Neuroscience Laboratories

Dr. William Stacey, M.D., Ph.D.
Affiliation: Department of Neurology, Department of Biomedical Engineering. University of Michigan
Position: Associate Professor

[Domestic]
Koichi Fujiwara, Ph.D.
Affiliation: Department of Systems Science, Graduate School of Informatics, Kyoto University.
Position: Associate professor

Dr. Koji Iida, M.D., Ph.D.
Affiliation: Department of Neurosurgery, Hiroshima University Hospital
Position: Associate Professor

Dr. Yushi Inoue, M.D., Ph.D.
Affiliation: Shizuoka Institute of Epilepsy and Neurological Disorders, National Epilepsy Center,
Department of Clinical Research
Position: Hospital director

Prof. Amami Kato, M.D., Ph.D.
Affiliation: Department of Neurosurgery, Kinki University Hospital
Position: Professor

Prof. Shigeki Kameyama, M.D., Ph.D.
Affiliation: Nishi-Niigata Chuo National Hospital
Position: Honorary hospital director

Prof. Takayuiki Kondo, M.D., Ph.D.
Affiliation: Department of Neurology, Kansai Medical University Medical Center
Position: Professor

Dr. Miho Miyajima, M.D.
Affiliation: Department of Psychosomatic and Palliative Medicine, Tokyo Medical And Dental University,
Medical Hospital
Position: Associate professor

Prof. Masatoshi Nakamura, Ph.D.
Affiliation: Research Institute of Systems Control, Institute for Advanced Research and Education, Saga University
Position: Emeritus professor (deceased)

Prof. Shigeto Nishida, Ph.D.
Affiliation: Department of Information and Communication Engineering, Faculty of Information Engineering,
Fukuoka Institute of Technology
Position: Professor

Dr. Teiichi Onuma, M.D., Ph.D.
Affiliation: Musashino Kokubunji Clinic
Position: Honorary hospital director

Dr. Rieko Osu, Ph.D.
Affiliation: Department of Motor Control and Rehabilitation, Brain Information Communication Research Labolatory
Group, Advanced Telecommunications Research Institute International (ATR)
Position: Department Head

Dr. Satoru Saito, Ph.D.
Affiliation: Division of Cognitive Psychology in Education, Kyoto University Graduate School of Education
Position: Professor

Prof. Yoshio Sakurai, Ph.D.
Affiliation: Laboratory of Neural Information, Graduate School of Brain Science, Doshisha University
Position: Professor

Dr. Hiroshi Shibasaki, M.D., Ph.D.
Affiliation: Kyoto University
Position: Professor Emeritus

Dr. Takenao Sugi, Ph.D.
Affiliation: Institute of Ocean Energy, Saga University
Position: Associate professor

Prof. Shoji Tsuji, M.D., Ph.D.
Affiliation: International University of Health and Welfare
Position: Professor

Dr. Satoshi Tsujimoto, Ph.D.
Affiliation: Department of Intelligence Science and Technology, Graduate School of Informatics, Kyoto University
Position: Associate professor

Dr. Hiroki Yamamoto, Ph.D.
Affiliation: Graduate School of Human and Environmental Studies, Kyoto University
Position: Assistant professor

Dr. Ikuko Yano, Ph.D.
Affiliation: Department of Pharmacokinetics and Pharmaceutics, Kobe University Graduate School of Medicine
Position: Associate professor

(Listed in the alphabetical order of their family names)

Direct recording of the neural oscillation in human brain
(Grant-in-Aid for Scientific Research on Innovative Areas from the Ministry of Education, Culture, Sports, Science and Technology, Japan: Non-linear Neuro-oscillology: Towards Integrative Understanding of Human Nature)

Prof. Ichiro Tsuda, Ph.D.
Affiliation: Chubu University Academy of Emerging Science
Position: Professor

Dr. Keiichi Kitajo, Ph.D.
Affiliation: Rhythm-based Brain Information Processing Unit, RIKEN Brain Science Institute
Position: Unit Leader

Prof. Katsunori Kitano, Ph.D.
Affiliation: Department of Human and Computer Intelligence, Ritsumeikan University
Position: Professor

Prof. Toshio Aoyagi, Ph.D.
Affiliation: Department of Applied Analysis and Complex Dynamical Systems,
Kyoto University Graduate School of Informatics
Position: Professor

Prof. Tatsuya Mima, M.D., Ph.D.
Affiliation: The Graduate School of Core Ethics and Frontier Sciences, Ritsumeikan University
Position: Professor

Dr. Hiroaki Wagatsuma, Ph.D.
Affiliation: Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology
Position: Associate Professor

Prof. Katsuhiro Kobayashi, M.D., Ph.D.
Affiliation: Department of Child Neurology, Okayama University Graduate School of Medicine
Position: Professor

Prof. Takashi Nagamine, M.D., Ph.D.
Affiliation: Department of Systems Neuroscience, Sapporo Medical University School of Medicine
Position: Professor

Neural basis of human body representation: a direct electrocorticographic recording and stimulation study. (Grant-in-Aid for Scientific Research on Innovative Areas from the Ministry of Education, Culture, Sports, Science and Technology, Japan: Understanding brain plasticity on body representations to promote their adaptive functions ("Embodied-Brain")

Dr. Eiichi Naito, Ph.D.
Affiliation: Center for Information and Neural Networks (CiNet), National Institute of Information and
Communications Technology (NICT)
Position: Research Manager

Prof. Hiroshi Imamizu, Ph.D.
Affiliation: Department of Intelligence Science and Technology, Graduate School of Informatics, University of Tokyo
Position: Professor

Dr. Takaki Maeda, M.D., Ph.D.
Affiliation: Department of Neuropsychiatry, Keio University School of Medicine
Position: Senior Lecturer

The elucidation of glial function in intractable epilepsy and standardization of clinical practice guidelines.
(Japan Agency for Medical Research and Development (AMED): Practical Research Project for Rare Diseases)

Prof. Taketoshi Maehara, M.D., Ph.D.
Affiliation: Department of Neurosurgery, Tokyo Medical and Dental University
Position: Professor

Prof. Akiyoshi Kakita, M.D., Ph.D.
Affiliation: Department of Pathology, Brain Research Institute, Niigata University
Position: Professor

Prof. Yukihiro Ohno, Ph.D.
Affiliation: Laboratory of Pharmacology, Osaka University of Pharmaceutical Sciences
Position: Professor

The establishment of diagnostic criteria and treatment for post-stroke epilepsy patients.
(AMED: Practical Research Project for Life-Style related Diseases including Cardiovascular Diseases and Diabetes Mellitus)

Dr. Masafumi Ihara, M.D., Ph.D.
Affiliation: Department of Stroke and Cerebrovascular Diseases, National Cerebral and Cardiovascular Center
Position: Director

Educational activities（～ May, 2018）

1）Offering the optimal education and research to Japanese and foreign physicians

■ EEG/Epilepsy fellowship

With great support by the Department of Neurology, we have set up the EEG/Epilepsy fellowship for training young neurologists, neurosurgeons, pediatricians, and psychiatrists. Seven adult neurologists, one pediatric neurologist, and three neurosurgeons have already completed this fellowship. Our education covers various fields of epileptology with a focus on clinical neurophysiology. We plan to welcome foreign young doctors for fellowship training as well.
Contents of the fellowship program are listed as follows;

1）Training of routine EEG reading (emergency EEG as well)
2）Analysis of the long-term video-EEG monitoring for diagnosis and presurgical evaluation
3）Clinical practice of adult epilepsy
4）Training of medical treatment with anti-epileptic drugs

Graduates of EEG/Epilepsy fellowship
Reiko Tsuda (from June 2011 to August 2011)
Takeshi Inoue (from April 2013 to March 2016)
Hajime Yoshimura (from July 2015 to September 2015)
Tsuyoshi Tsukada (from October 2015 to March 2016)
Daiki Fujii (from September 2014 to November 2014, from February 2016 to March 2017)
Masayuki Honda (from April 2016 to March 2018)
Haruo Yamanaka (from January 2017 to March 2017)
Nobutaka Mukae (from June 2017 to July 2017)
Norihiro Muraoka (from October 2017 to March 2018)
Current Trainee of EEG/Epilepsy fellowship
Toshikazu Hamaguchi (from May 2017-)
Tomoaki Taguchi (from April 2018 to June 2018)

■ Intramural, multidisciplinary monthly case conference

In cooperation of the Departments of Neurology, Neurosurgery, Pediatrics, Diagnostic Radiology, Psychiatry, Rehabilitation, and Clinical Laboratory Medicine, and Human Brain Research Center, we have been holding the intramural, multidisciplinary monthly case conference for more than a decade. In the conference, we discuss the diagnosis and surgical indication of epilepsy patients for comprehensive epilepsy practice as a tertiary epilepsy special facility. The numbers of participants and the discussed cases are getting larger. As a training facility certified by Japan Epilepsy Society (JES), this conference is open for doctors outside the hospital to discuss their problem case or to obtain the credit to apply board examination of JES-certified epileptologist.

■ EEG conferences and so on

For our graduate students and EEG/Epilepsy fellows, we have been offering multifaceted educational and research trainings, such as EEG reading skills in EEG conferences twice a week, seeing outpatients and inpatients with staffs, and epilepsy/clinical neurophysiology researches. One EEG conference and research conference are held in English for training skills in English presentation. The other conference is held in Japanese and open for the in-hospital technicians and out-hospital doctors for providing them with training opportunities for the practical basic EEG reading skills (about 30-40 participants).

■ **Specialist training**

In the fiscal year 2016-2017, our department produced five board-certified epileptologists (JES).

■ **Extramural workshops**

Regarding educational activities outside the institute, as the secretary office in general, we have organized the district EEG & EMG teaching course for the young doctors and technicians in Kansai (Kansai EEG & EMG workshop) every year since 2008. In 2015, we newly founded and organized the EEG seminar advanced course for the purpose of acquisition of specialized knowledge and reading skills in clinical EEG sponsored and supervised by the Japanese Society of Clinical Neurophysiology. We also have provided educational activities by complying the request of lectures nationwidely (please refer to the achievements for details). Both staffs regularly teach EEG reading and epileptology at the affiliated hospitals.

■ **EEG/Epilepsy lecture series**

We have been holding the intensive lecture series of the basics of EEG and epileptology for EEG/Epilepsy fellows and young doctors.

2）Offering medical staffs' education for caring of epilepsy patients

In the Kyoto University Hospital, we have offered education for epilepsy and related disorders to doctors and medical staffs. For the medical staffs in the Neurology clinic and ward, we hold comprehensive monthly lectures about pathophysiology of epilepsy, seizure semiology, and medical care of patients living with epilepsy.

3）Providing patients, family and society with valuable information

We have responded to the request by the patients, family, and society in cooperation with Japan Epilepsy Association. For example, we have joined the lectures sponsored by Japan Epilepsy Association for the public, and also the continuing medical education lectures for physicians by Japan Medical Association.

Interdisciplinary monthly case conference

EMU EEG Conference in English

EEG Conference held in Japanese

Clinical activities（～ May, 2018）

1）Outpatient Epilepsy Clinic. Promoting cooperation between hospitals and clinics for epilepsy care

As a team of specialists, we have made full efforts to provide the best care to patients suffering from epilepsy or movement disorders. Until recently, epilepsy has been recognized as a childhood-onset disease. However, with the advent of a superaging society, epilepsy that develops in the middle-aged or elderly has become a current problem in Japan. In addition, the number of the hospitals and physicians that can offer the epilepsy care is not adequate. Moreover, it is unclear which department, neurology, neurosurgery, or psychiatry, is in charge for the adult epilepsy service. In order to offer the optimal epilepsy care, it is very important to establish the cooperation model among general physicians and epilepsy specialists for epilepsy care like that in European and North American countries. As a tertiary care institute for epilepsy in Kyoto, we have led cooperation among primary, secondary and tertiary facilities in the Kinki district (esp. in Kyoto-Shiga region) to provide a comprehensive epilepsy service with a dedicated team of neurologists, neurosurgeons, pediatricians and psychiatrists.

In the fiscal year 2016 and 2017, we saw 1072 and 1125 outpatients, respectively. 182 and 187 patients were newly consulted from other hospitals and clinics in the Kinki district in In the fiscal year 2016 and 2017, respectively. We promoted hospital-clinic cooperation by returning the referral patients to their local clinics and hospitals.

2）Inpatient evaluation and treatment for epilepsy (including video-EEG monitoring)

Since 1991, we have been running the epilepsy monitoring unit (EMU) in the Neurology Ward for evaluation of patients with epilepsy. We now have two dedicated rooms for EMU, equipped with the digital video-EEG system.
By capturing seizures with simultaneous video and EEG recording, we can perform

i) An accurate diagnosis of epilepsy: To determine whether the seizure is epileptic or non-epileptic, including movement or psychogenic disorders,
ii) Identification of epileptic focus: To locate the epileptic focus for epilepsy surgery in patients with medically intractable epilepsy.

In the fiscal year 2016 and 2017, we examined 90 patients in the EMU (subdural/depth electrode implantation: 6).

In addition, we provide patients with multidisciplinary studies for comprehensive evaluation, such as 3 tesla MRI, routine EEG, FDG-PET/SPECT, MEG and neuropsychological testing. Routine EEGs were performed in 1169 patients (including 860 outpatients) and 1357 patients (including 992 outpatients) in this fiscal year 2016 and 2017, respectively.

3）Epilepsy Surgery

We have established an epilepsy surgery program with close collaboration with the Department of Neurosurgery since 1991. Since the first epilepsy surgery in 1992, we have performed more than 190 epilepsy surgeries, with the majority of patients having seizure freedom or substantial decrease of seizure frequency leading to better QOL. We provide each patient with the individually tailored surgery plan by incorporating the findings of the multimodal studies (see below) as well as the Wada test. The patients may proceed to the invasive presurgical evaluation with intracranial electrodes (subdural and/or depth electrodes) when the epileptic focus cannot be precisely localized (such as in cases with non-lesional MRI) or the focus is located at or around the functionally important areas such as motor or language cortices. In such cases, the patients undergo the first surgery for implantation of intracranial electrodes. After electrode implantation, the patients are evaluated for the epileptic focus (by recording seizures) and the functional cortical areas (by incorporating the state-of-art mapping techniques) for 1-2 weeks. Then, the patients undergo the second surgery for resection of the epileptic focus. The patients may undergo the awake brain surgery, where the patients wake up from anesthesia if necessary. Awake surgery has the advantage to evaluate the brain functions such as motor and language during resection and monitor the 'natural' epileptic spikes without any influence from anesthetics. In the fiscal 2016, our team performed epilepsy surgery in 7 patients (3 with chronic intracranial electrode implantation) and awake brain surgery about 23 patients (including non-epilepsy cases), and in

the fiscal 2017, our team performed epilepsy surgery in 9 patients (4 with chronic intracranial electrode implantation) and awake brain surgery about 26 patients (including non-epilepsy cases).

4) Examinations for epilepsy

As the tertiary care epilepsy facility, we provide patients with the state-of-arts studies for the evaluation of epilepsy. As the comprehensive epilepsy program in the national university hospital, we incorporate the leading techniques as clinical research studies (IRB approved) for the optimal presurgical evaluations.

- Electroencephalography (EEG)
- Magnetoencephalography (MEG)
- FDG-PET (18F-fluorodeoxyglucose positron emission tomography)
  SPECT (Single photon emission computed tomography) including ictal SPECT
- 3 tesla MRI
- functional MRI (fMRI)
- EEG-fMRI (simultaneous EEG and functional MRI recording)
- Neuropsychological testing (WAIS-III, WMS-R, WAB, semantic batteries and Kanji/Kana related tasks)
- invasive EEG monitoring with intracranial electrodes
  Recently, autoimmune epilepsy is regarded as one of the important cause of epilepsy. Following tests are diagnostic for autoimmune epilepsy.
- Cerebrospinal fluid / serum antibody test

5) Development of novel treatments for epilepsy

i) Interventional Neurophysiology: Recently, neurophysiology has been highlighted for its application to treatment of various neurological diseases. In our hospital, we apply a novel interventional neurophysiology method, neurofeedback treatment, to medically intractable patients in whom epilepsy surgery is not applicable. Patients train themselves to control the brain activity (by adjusting slow EEG potentials) to suppress epileptic seizure activity. Our preliminary study shows a good efficacy as comparable to that for the Vagus Nerve Stimulation.

ii) Promoting the clinical trials for new anti-epileptic drugs.

6) Diagnosis and treatment for movement disorders

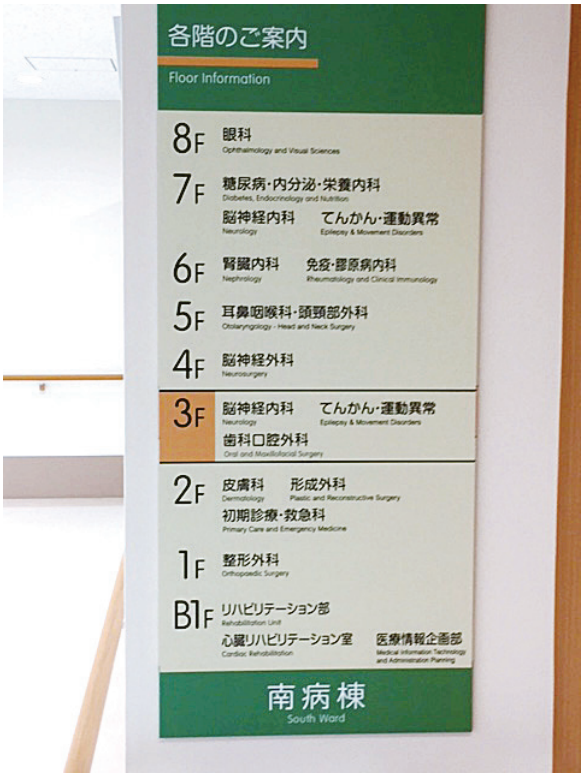
It is also our mission to provide the optimal care for patients with movement disorders. We provide precise diagnosis using advanced diagnostic tools for better treatment of movement disorders such as tremor, myoclonus, dystonia and other involuntary movements.

The pathophysiology of movement disorders, however, is not fully understood. We have been investigating their pathophysiology and treatment in close collaboration with the Department of Neurology and Human Brain Research Center (HBRC).

7) Simulation training of brain death determination

Since Organ Transplant Law went into force in 1997, we, in close collaboration with the affiliated departments, have been regularly practicing the course 'Simulation-based training in brain death determination'. In this course, we simulate the management about how and what to do when the donor is found and until organs are taken. The training is highly practical for those in charge of brain death determination in our hospital. We also participated in the first case of brain death determination of Kyoto University Hospital in close collaboration with many affiliated departments.

Two EMUs are in Neurology ward in the 3rd Floor of South Ward



Research grants obtained from extramural sources & awards（～ May, 2018）

The ministry of Education, Culture, Sports, Science and Technology of Japan Grant-in-Aids for Scientific Research (KAKENHI)

Fiscal years 2014-2016
Grant-in-Aid for Scientific Research (B)
Principal investigator: Akio Ikeda
Subject number: 26293209

Fiscal years 2014-2017
Grant-in-Aid for Scientific Research (B)
Principal investigator: Riki Matsumoto
Subject number: 26282218

Fiscal years 2015-2019
Grant-in-Aid for Scientific Research on Innovative Areas (Non-linear Oscillology)
Principal investigator: Akio Ikeda
Subject number: 15H05874

Fiscal years 2015-2016
Grant-in-Aid for Scientific Research on Innovative Areas
Principal investigator: Riki Matsumoto
Subject number: 15H01664

Fiscal years 2015-2017
Grant-in-Aid for Scientific Research (C)
Principal investigator: Morito Inouchi
Subject number: 15K09351

Fiscal years 2017-2018
Grant-in-Aid for Scientific Research on Innovative Areas
Principal investigator: Riki Matsumoto
Subject number: 17H05907

Fiscal years 2018-2021
Grant-in-Aid for Scientific Research (B)
Principal investigator: Riki Matsumoto
Subject number: 18H02709

Fiscal years 2018-2020
Grant-in-Aid for Challenging Exploratory Research
Principal investigator: Akio Ikeda
Subject number: 18K19514

Health Labour Sciences Research Grant

Fiscal years 2014-2016
Principal investigator: Yushi Inoue
Co-investigator: Akio Ikeda
Subject number: H26 - 難治等 - 一般 - 051

Fiscal years 2017-2018
Principal investigator: Yushi Inoue
Co-investigator: Akio Ikeda
Subject number: H29 - 難治等(難) - 一般 - 010

Japan Agency for Medical Research and Development (AMED)

Fiscal years 2015-2017
Co-investigator: Akio Ikeda
Subject number: 15ek0109120h0001

Fiscal years 2016-2019
Co-investigator: Akio Ikeda
Subject number: 16ek0210057h0001, 17ek0210057h0003

Fiscal years 2018-2021
Co-investigator: Akio Ikeda
Subject number: 18ek0109120h0001

Others

The Japan Epilepsy Research Foundation Research Grant
Fiscal years 2014-2016
Principal investigator: Riki Matsumoto

The Japan Epilepsy Research Foundation Research Grant
Fiscal years 2014-2016
Principal investigator: Tomoyuki Fumuro

The Japan Epilepsy Research Foundation Research Grant
Fiscal years 2016-2018
Principal investigator: Katsuya Kobayashi

The Japan Epilepsy Research Foundation Research Grant
Fiscal years 2017-2019
Principal investigator: Akihiro Shimotake

Awards

Akio Ikeda: Masakazu Seino Memorial Lecture
The 11th Asian & Oceanian Epilepsy Congress (AOEC), Hong Kong, May 2016

Riki Matsumoto, Takeharu Kunieda: The Japan Epilepsy Research Foundation Research Award 2016

The 51st Annual Congress of the Japan Epilepsy Society

The 51st Congress of the Japan Epilepsy Society was successfully held for three days from November 3 (Friday) to November 5 (Sunday), 2017 at the Kyoto International Conference Center (KICC), Takaragaike, Kyoto City.

419 presentations (oral and poster) were performed. In total, 1959 medical staffs, students and invited members participated.

This time, the theme was formulated as "Best care, Best research and Future". The context of epilepsy significantly varies but commonly closely interrelated aspects such as basic medicine, clinical medicine, treatment and care. Due to improving mutual links, i.e., translatability, epilepsy is expected to become a curable disease in the very near future. Providing the best "care" requires constant backup from basic and clinical "research", being two halves of the whole. The key to this goal is lifelong, continuous education by which we can pass the current research to the "future". These thoughts has underlined this year's theme.

1) Free abstract submission: We are thankful to have received 419 abstract submission for general presentation, the largest number ever in the previous JES annual congresses. We understand that this is due to the 21st century's rapidly evolving developments in various aspects of epilepsy including basic research (iPS cell research, understanding of neuronal networks and pathogenesis based on potassium or chloride homeostasis), clinical medicine (plenty of new drugs, new clinical entity such as autoimmune epilepsy and genetic abnormality, epilepsy in the elderly, new diagnostic technology, brain stimulation therapy and a progress in epilepsy definition and seizure and epilepsy classification), and epilepsy care (regional, epilepsy care networks, international campaign against epilepsy, etc.).

2) Special lectures: We cordially invited three distinguished professors from abroad. They kindly informed us about the most important content in their respective fields. Namely, as introduced in the order of lectures in the congress, Prof. Samuel Wiebe, ILAE President (Canada) gave the lecture on the topic as "Precision Medicine in Epilepsy", Prof. Alexis A. Arzimanoglou (France) presented "Newly Evolving Concept of Childhood Epilepsy Syndrome" based on the new international classification 2017, and Prof. Jean Gotman (Canada) spoke about the latest development in digital electroencephalography as "EEG, the New Frontier".

3) Honorary educational lectures: We had asked three Senior Professors or Professors Emeritus to deliver their inspiring messages to young clinicians, researchers and physician-scientists. As introduced in the order of lectures in the congress, Prof. Emeritus Hiroshi Shibasaki, Kyoto University, spoke on the concept of research and clinical practice in his lecture: "Pathophysiology of Cortical Myoclonus". Prof. Hans O. Lüders (USA) discussed the concept of epileptogenic focus and its network in his lecture: "Concept of Epileptogenic Zone". Prof. Emeritus Tatsuya Tanaka, former ILAE Vice-President, presented the comprehensive overview on generalized seizures from the experimental epilepsy in his lecture: "Primary Generalized Seizure and Secondarily Generalized Seizure: What We Have Learned from Experimental Models of Epilepsy".

4) AOEC (Asian & Oceanian Epilepsy Congress) expert lectures (two lectures)): We had asked Prof. Shih-Hui Lim and Prof. Byung In Lee, the previous Chairmens of CAOA (Commission on Asian and Oceanian Affairs), ILAE, the 2nd and 3rd respectively, to deliver educational lectures. CAOA includes a highly regarded educational task force called ASEPA (Asian Epilepsy Academy), established by the late Prof. Masakazu Seino, former JES President, by far prior to five regional structures of ILAE other than CAOA. Both professors have contributed a great deal to ASEPA development as a chairmen, and have delivered many lectures throughout Asia and Oceania. Based on their valuable experience, Prof. Shih-Hui Lim (Singapore) delivered a lecture entitled "Training and Education in Epileptology – From Achieving Competences to Building Capabilities" about fostering self-learning capability of the specialists in epileptology education and training based on methodology of education. Prof. Byung In Lee spoke on the latest antiepileptic drugs in his lecture: "Essence of Drug Treatment in Epilepsy".

5) Congress Chairman's lecture: Based on the title as "Neurons, Glia and Epilepsy: Is it a Paradigm Shift ?", As the Congress Chairman Akio Ikeda demonstrated the results of data accumulation in an institute, multi-institutional collaborative research, standardization of recording and data analysis, collaborative researches in the neuropathology and in the mathematical modeling. Particularly, we strongly understood, within the JES, the importance of establishing a system of multi-institutional collaborative, large-scale studies such as one already developed in the western countries, and thus we hold the Workshop 2: "Towards Multi-Institutional Collaborative Large-Scale Studies".

6) Nine symposia (including two JES-KES symposia) and nine workshops: The themes of symposia and workshops were formulated based on the results of questionnaire surveys conducted among the JES board members before summer 2016. Afterwards, two organizers per one program – mainly, members of Program Committee and Steering Committee – specialized in each respective themes were assigned for each program to construct the outline, targets, and then appropriate candidate speakers. As a result, we could reflect the wide opinions of many experts in the JES. In addition, we aimed at minimizing the overlap of speakers as small as possible in order to provide as many experts as possible with opportunity of speakers.

The programs covered a wide range from fundamental themes to the cutting-edge issues (iPS and epilepsy, telemedicine, epileptogenesis and network, epilepsy in the elderly, glia and epilepsy, etc.). As in the previous years, the important issues were complementarily covered by the programs organized by the JES permanent committees (Committee of Gender Equality, Committee of Promotion of Basic Research, and Committee of Long-Term Program). As regards to workshops, we also held sessions to deepen our understanding through debates such as "Pros and cons of epileptic surgery".

JES-KES symposium was dedicated to 1) "mTOR Pathway and AMPA" and 2) "Emotional Disturbance in People with Epilepsy"; these themes were finalized through the discussion between JES Committee of International Affairs and KES.

In each symposia and workshops, we successfully had a fruitful discussion.

7) 11 educational lectures and 16 marathon lectures: The educational lectures and marathon lectures dealed with lifelong education of medical specialists and basic content at the beginner level, respectively; both provided opportunities for learning educational programs during 2 full days.

8) Others: In addition to the usual program, a newly planned medical staff session was scheduled. After the closing ceremony at noon, a two-part public lectures ("Let's Know Epilepsy More") was given; with regard to cooperation on epilepsy care between local clinics and hospitals, members of Kyoto Medical Association were helpful in planning as well as assigning speakers and chairmen. Many medical practioners participated in the program by means of one-day admission tickets. In the post-congress symposium ("Advanced ECoG/EEG and Analysis in Epilepsy"), two foreign speakers and four Japanese speakers kindly gave us lectures and discussion, and posters within the session were also presented.

9) Art Exhibition around Epilepsy 2017

The Art Exhibition around Epilepsy 2017 was held from 1st to 5th of November, 2017, during the 51st Congress of the Japan Epilepsy Society. The first exhibition was held in 2016 based on a proposal from Dr. Yushi Inoue, Chair of the Congress. The motive for the organization of the exhibition was the necessity to understand ways to communicate with people suffering from illness, especially expressions other than words. With help of many people including Prof. Shiro Matsui, Prof. Toru Koyamada and Mr. Tsuyoshi Yamada of Kyoto City University of Arts, Prof. Takayuki Shiose of Kyoto University Museum, and Prof. Motomi Toichi of Human Health Science, Graduate School of Medicine, Kyoto University, we tried to shed light to the background and episode through which each work was created, let alone the work itself, so the visitors understand the relationship of people around epilepsy. In addition to the artistic works, exhibition of the historical figures who suffered from epilepsy and interviews to physicians, comedicals and patients with epilepsy were displayed to aid better understanding toward epilepsy by the general public. Total of 86 works were exhibited by patients, families and other people, and more than 1300 visitors enjoyed the exhibition over the five days. The exhibition attracted favorable comments from the foreign visitors, and a work by MAMI appeared the cover of February 2018 issue of Epilepsy and Behavior journal through the recommendation by Dr. Marylin Gotman and the chief-editor Prof. Steven Schachter. Because of this, we are preparing an English version of the collection of works from Art Exhibition around Epilepsy.

We would like to express our deep gratitude again to all who cooperated in preparation for the Congress, i.e., JES office, congress office in the Departments of Epilepsy, Movement Disorders, and Physiology, and of Neurology, Ktoto University Graduate School of Medicine and ad hoc committees for annual congress (Program Committee, Steering Committee, many organizers for programed events, the Executive Committee of Art for Epilepsy Exhibition 2017) and so on.

Ⅳ Society-academia collaboration

As society-academia collaboration, both collaborative study and teaching seminar were conducted. All activities were conducted with the companies under the regulation of Kyoto University Graduate School of Medicine and University Hospital and under the regulation of Japanese law. Therefore, the detailed English version was not made, and please refer to the Japanese part of this report in details.

Only the name of company and the content of collaboration were listed as follows.

1) Collaborative study

NIHON KOHDEN CORPORATION

Clinical and technical establishment of remote reading system of digital EEG in Japan

UCB Japan Co., Ltd.

Phase III clinical trial of Lacosamide

2) Teaching seminars

Japan Epilepsy Society (Kinki Region)

UCB Japan Co., Ltd.

Otsuka Pharmaceutical Co.,

Nihon Kohden Co.,

Clinical adult epilepsy seminar in Kinki district area: a half day course in 2017.

V 業績報告 Publications and Congress Presentations

誌上発表　Publications（2016 年 9 月～ 2018 年 9 月）

原著　Original articles

〈英文　English articles〉

1. Neshige S, Kobayashi K, Shimotake A, Iemura T, Matsumoto R, Nishinaka K, Matsumoto M, Takahashi R, Ikeda A: An elderly woman with exaggerated startle reflex and unconscious drop attack. ***Neurology and Clinical Neuroscience*** 2016, 4: 156-158.

2. Fukuma K, Ihara M, Miyashita K, Motoyama R, Tanaka T, Kajimoto K, Ikeda A, Nagatsuka K: Right parietal source in Mahjong-induced seizure: a system epilepsy of focal origin. ***Clinical Case Reports*** 2016, Aug 23, 4(10): 948-951.

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学会・研究会発表　Presentations（2016年6月～ 2018年9月）

学会発表　Congress presentations

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32. 池田昭夫：てんかん原性の臨床生理学的 biomaker: red slow はあるか？．第12回日本てんかん学会近畿地方会特別講演（2016/7/23，大阪）．

33. 松本理器，山尾幸広，菊池隆幸，吉田和道，國枝武治：単発電気刺激による脳内ネットワークの可視化：着想から臨床応用への道のり（特別企画4 機能ネットワーク解明から治療への応用）．第75回日本脳神経外科学会学術総会（2016/9/29-10/1，福岡）．

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35. 池田昭夫：JES スカラーシップ，Sponsored award の意義（企画セッション10『てんかん学研修システムを考える』）．第50回日本てんかん学会学術集会（2016/10/7-9，静岡）．

36. 池田昭夫：臨床てんかん学における Wide-band EEG の概要と有用性（イブニングセミナー）．第50回日本てんかん学会学術集会（2016/10/7-9，静岡）．

37. 松本理器：認知症とてんかん（アドバンスドコース11）．第50回日本てんかん学会学術集会（2016/10/7-9, 静岡）．

38. 池田昭夫：頭痛診療医に必要なてんかんの知識と鑑別診断：症例を通じて（てんかんと片頭痛の興奮性の違いは？）（ランチョンセミナー 3）．第44回日本頭痛学会総会，（2016/10/21-22，京都）．

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41. 池田昭夫：てんかん原性の臨床生理学的 biomarker：red slow はあるか？（教育講演11）．第46回日本臨床神経生理学会（2016/10/27-29，郡山）．

42. 池田昭夫：てんかん性異常と関連脳波所見．第10回脳波・筋電図セミナー（2017/1/21，京都）．

43. 池田昭夫：脳波レポートの書き方．第10回脳波・筋電図セミナー（2017/1/21，京都）．

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46. 池田昭夫：脳神経外科医のためのデジタル脳波講習会．第73回日本脳神経外科学会近畿支部学術集会（2017/4/8，大阪）．

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49. 池田昭夫：てんかん診療アップデート：新規薬と道路交通法．日本神経学会第14回生涯教育セミナーレクチャー（2017/5/14，東京）．

50. Matsumoto R: Introduction. Dual stream model of language - its function, connectivity and plasticity: insights from clinical neuroscience．第40回日本神経科学大会（2017/7/22，東京）．

51. 池田昭夫：講義8脳波レポートの書き方．日本臨床神経生理学会．第3回脳波セミナー・アドバンスコース（2017/7/30，京都）．

52. 池田昭夫：グリアとニューロンの視点からの Wide band EEG の臨床的意義．第5回 Functional Neurosurgery Conference in Chiba（2017/8/5，千葉）．

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54. Ikeda A: Glial dysfunction and intractable epilepsy-from basic to clinical studies-Glia, DC shifts/red slow, and epilepsy（難治てんかん焦点におけるグリアの役割：臨床神経生理学からのアプローチ）．第60回日本神経化学会大会（2017/9/9，仙台）．

55. Matsumoto R, Kobayashi K, Kikuchi T, Yoshida K, Kunieda T, Miyamoto S, Ikeda A: Novel surrogate biomarkers of epileptogenicity using wideband ECoG analyses. Symposium: Novel approaches for localization of epileptogenic zone．日本脳神経外科学会第76回学術総会（2017/10/12，名古屋）．

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58. 下竹昭寛：マラソンレクチャー：vEEG 成人ケーススタディ（Long-term video EEG monitoring in adults）．第51回日本てんかん学会学術集会（2017/11/3，京都）．

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60. 池田昭夫：Neuron, glia and epilepsy: is it a paradigm shift? 第51回日本てんかん学会学術集会 会長講演（2017/11/4, 京都）.

61. 松本理器，下竹昭寛，菊池隆幸，國枝武治，池田昭夫：皮質脳波と高次脳機能ネットワーク．第47回日本臨床神経生理学会（2017/11/25，横浜）.

62. 池田昭夫：新規抗てんかん薬の使い方 Update．第35回日本神経治療学会総会（2017/11/27，大宮）.

63. 人見健文，谷岡洸介，髙橋良輔，池田昭夫：日本の地域レベルでの遠隔脳波判読の取り組みの現状と問題点 シンポジウム It's a small world: remote reading system of digital EEG．第47回日本臨床神経生理学会（2017/11/29，横浜）.

64. 池田昭夫：wide-band EEG の記録解析の診療ガイドラインへむけて，シンポジウム13，難治性てんかん病態におけるグリア機能と wide-band EEG．第47回日本臨床神経生理学会（2017/11/30，横浜）.

65. 池田昭夫：てんかん性異常と関連脳波所見（初級編）．日本臨床神経生理学会関連講習会，第11回脳波・筋電図セミナー（2018/1/20，京都）.

66. 池田昭夫：脳波の時間広域周波数帯域解析の入門．日本臨床神経生理学会関連講習会，第11回脳波・筋電図セミナー（2018/1/20，京都）.

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68. 池田昭夫:世界てんかんの日（IED）2018記念イベント, 1）てんかんを取り巻く世界の動き, 2）てんかんって なーあに？（2018/2/12，東京）.

69. 池田昭夫：頭痛診療医に必要なてんかんの知識と鑑別診断：てんかんと片頭痛の興奮性の違いは？頭痛フォーラム2018（2018/2/25，渋谷）.

70. 池田昭夫：難治てんかんの克服を目指したグリア病態研究．大阪薬科大学第1回学術交流シンポジウム（2018/4/21，大阪）.

71. 松本理器，小林勝哉，人見健文，池田昭夫：ミオクローヌスてんかんの脳波特性．S-08 ミオクローヌスの最近の知見．第59回日本神経学会学術大会（2018/5/23-26，札幌）.

72. 池田昭夫：典型的ビデオ紹介, 教育コース, てんかんとは?．第59回日本神経学会学術大会（2018/5/23-26, 札幌）.

73. 池田昭夫：Hands-on 7「脳波」．第59回日本神経学会学術大会（2018/5/23-26，札幌）.

74. Ikeda A: Glia and epileptogenicity from the clinical approach. Symposium 22 New fronteer of epleptogenicity: Translatability between basic and clinical fields 第59回日本神経学会学術大会（2018/5/23-26, 札幌）.

75. 池田昭夫：グルタミン酸受容体拮抗薬の作用機序－基礎と臨床の trasnlatability－ PDS と抗てんかん薬～臨床の立場から～． 第60回日本小児神経学会学術集会（2018/5/30-6/2，千葉）.

76. 池田昭夫：急性発作性の運動異常症てんかん関連運動異常および PKC：てんかん発作との類似点と鑑別．第12回日本パーキンソン病・運動障害疾患コングレス（2018/7/5-7，京都）.

■一般発表　Oral and poster presentations

国際学会　International presentations

1. Ota M, Shimotake A, Matsumoto R, Sakamoto M, Daifu M, Nakae T, Kunieda T, Miyamoto S, Takahashi R, Lambon-Ralph MA, Ikeda A: Kanji word processing in the ventral anterior temporal lobe: a postoperative neuropsychological study in patients with temporal lobe epilepsy, Annual Meeting of Society for Neuroscience (Neuroscience 2016) (2016/11/12-16, San Diego, USA).

2. Daifu M, Matsumoto R, Shimotake A, Kobayashi K, Ota M, Sakamoto M, Nakae T, Kikuchi T, Yoshida K, Kunieda T, Takahashi R, Lambon Ralph MA, Ikeda A: The ventral part of the anterior temporal lobe actively engages in Kanji word processing: a direct cortical stimulation study, 70th American Epilepsy Society Annual Meeting (2016/12/2-6, Houston, USA).

3. Kobayashi K, Hitomi T, Matsumoto R, Watanabe M, Takahashi R, Ikeda A: Clinical core symptoms are rather homogeneous in nationwide survey of benign adult familial myoclonus epilepsy, 70th American Epilepsy Society Annual Meeting (2016/12/2-6, Houston, USA).

4. Daifu M, Inouchi M, Matsuhashi M, Kobayashi K, Shimotake A, Hitomi T, Yoshida K, Kunieda T, Matsumoto R, Takahashi R, Ikeda A: Co-occurrence of slow and high frequency oscillations (HFOs) in invasively recorded, interictal state in epilepsy patients: Is it a 'Red slow'? The XXX III World Congress of Neurology (2017/9/16-21, Kyoto, Japan).

5. Kobayashi K, Matsumoto R, Usami K, Matsuhashi M, Shimotake A, Nakae T, Takeyama H, Kikuchi T, Yoshida K, Kunieda T, Takahashi R, Ikeda A: Safety of single-pulse electrical stimulation for cortico-cortical evoked potentials in epileptic human cerebral cortex, The XXX III World Congress of Neurology (2017/9/16-21, Kyoto, Japan).

6. Ota M, Shimotake A, Matsumoto R, Sakamoto M, Daifu M, Nakae T, Kikuchi T, Yoshida K, Kunieda T, Miyamoto S, Takahashi R, Matthew L.R, Ikeda A: Compensatory semantic processing after resection of the anterior temporal lobe in epilepsy surgery, The XXX III World Congress of Neurology (2017/9/16-21, Kyoto, Japan).

7. Murai T, Matsuhashi M, Hitomi T, Kobayashi K, Shimotake A, Inouchi M, Kikuchi T, Yoshida K, Kunieda T, Matsumoto R, Takahashi R, Ikeda A: Invasive 3D source localization by wide-band electroencephalography findings, The XXX III World Congress of Neurology (2017/9/16-21, Kyoto, Japan).

8. Nakatani M, Matsumoto R, Kobayashi K, Hitomi T, Inouchi M, Matsuhashi M, Kinoshita M, Kikuchi T, Yoshida K, Kunieda T, Takahashi R, Hattori N and Ikeda A: Inhibitory effects of electric cortical stimulation on interictal epileptiform discharges in human epileptic focus, The XXX III World Congress of Neurology (2017/9/16-21, Kyoto, Japan).

9. Neshige S, Matsuhashi M, Sakurai T, Kobayashi K, Shimotake A, Kikuchi T, Yoshida K, Kunieda T, Matsumoto R, Maruyama H, Takahashi R and Ikeda A: Efficacy of Wide-Band Electrocorticography(ECoG) on Mapping of the Primary Sensori-Motor Area Compared with Electrical Cortical Stimulation (ECS), The XXX III World Congress of Neurology (2017/9/16-21, Kyoto, Japan).

10. Sakamoto M, Matsumoto R, Togawa J, Takeyama H, Hashi Y, Kobayashi K, Shimotake A, Leypoldt F, Wandinger K.P, Kondo T, Takahashi R, Ikeda A: Proposal of a diagnostic algorithm for autoimmune epilepsy: a preliminary retrospective cohort study, The XXX III World Congress of Neurology (2017/9/16-21, Kyoto, Japan).

11. Sultana S, Hitomi T, Daifu M, Matsuhashi M, Takahashi R, Ikeda A: Comparison in after-slow activity of epileptiform discharges and sharp transients among different time constant: further endorsement of operational definition of spike/sharp wave vs. sharp transients, The XXX III World Congress of Neurology (2017/9/16-21, Kyoto, Japan).

12. Takeyama H, Matsumoto R, Usami K, Shimotake A, Kunieda T, Miyamoto S, Takahashi R, Ikeda A: Higher-order motor cortices actively engage in motor inhibition: cortical stimulation and event-related potentials as an evidence from subdural electrodes. The XXX III World Congress of Neurology (2017/9/16-21, Kyoto, Japan).

13. Togo M, Matsumoto R, Shimotake A, Kobayashi T, Kikuchi T, Yoshida K, Matsuhashi M, Kunieda T, Miyamoto S, Takahashi R, Ikeda A: Role of the negative motor area in praxis: A high frequency electrical cortical stimulation study, The XXX III World Congress of Neurology (2017/9/16-21, Kyoto, Japan).

14. Hitomi T, Kobayashi K, Murai T, Sakurai T, Matsumoto R, Takahashi R, Ikeda A: Positive rate of giant somatosensory evoked potential (giant SEP) and C reflex in benign adult familial myoclonus epilepsy (BAFME), The XXX III World Congress of Neurology (2017/9/16-21, Kyoto, Japan).

15. Kinboshi M, Mukai T, Nagao Y, Shimizu S, Ito H, Ikeda A, Ohno Y: Dysfunction of astrocytic Kir4.1 channels induces BDNF expression. The XXX III World Congress of Neurology (2017/9/16-21, Kyoto, Japan).

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17. Kikuchi T, Ishii A, Chihara H, Arai D, Ando M, Takenobu Y, Okada T, Takagi Y, Miyamoto S. Occlusion status on Magnetic Resonance Angiography is associated with risk of delayed ischemic events in cerebral aneurysms treated with stent-assisted coiling. 14TH CONGRESS OF THE WORLD FEDERATION OF INTERVENTIONAL AND THERAPEUTIC NEURORADIOLOGY (2017/10/19, Hungary).

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21. Nakatani M, Matsumoto R, Kobayashi K, Hitomi T, Inouchi M, Matsuhashi M, Kinoshita M, Kikuchi T, Yoshida K, Kunieda T, Takahashi R, Hattori N, Ikeda A: Electric cortical stimulation inhibits interictal epileptiform discharge and related high frequency activity in human epileptic focus. The 71st American Epilepsy Society Annual meeting 2017. (2017/12/2, Washington D.C, USA).

22. Togawa J, Inouchi M, Matsumoto R, Matsuhashi M, Kobayashi K, Usami K, Hitomi T, Nakae T, Kikuchi T, Yoshida K, Kunieda T, Miyamoto S, Takahashi R, Ikeda A: Spatio-temporal dynamics of interaction between slow and fast waves in humans during sleep. The 71st American Epilepsy Society Annual meeting 2017 (2017/12/2, Washington D.C, USA).

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24. Togo M, Matsumoto R, Shimotake A, Kobayashi T, Kikuchi T, Yoshida K, Kunieda T, Miyamoto S, Takahashi R, Ikeda A: Role of the premotor and precentral negative motor area in praxis: a direct electrical stimulation study with behavioral analysis: 31st International Congress of Clinical Neurophysiology (2018/5/1-6, Washington DC, USA).

25. Usami K, Korzeniewska A, Matsumoto R, Hitomi T, Kunieda T, Mikuni N, Kobayashi K, Kikuchi T, Yoshida K, Miyamoto S, Takahashi R, Ikeda A, and Crone NE: Changes in human brain network connectivity during sleep and wakefulness – a study of neural propagation evoked by single-pulse electrical stimulation: 31st International Congress of Clinical Neurophysiology (2018/5/1-6, Washington DC, USA).

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33. Hitomi T, Kobayashi K, Takeyo Sakurai, Murai T, Sultana S, Kinoshita M, Shimotake A, Matsumoto R, Takahashi R, Ikeda A: A homozygotic mutation with severe benign adult familial myoclonus epilepsy (BAFME): a case report: the 12th Asian&Oseanian Epilepsy Congress (2018/6/28-7/1, Bali, Indonesia).

34. Hitomi T, Kobayashi K, Neshige S, Sultana S, Kei Sato, Tanioka K, Shimotake A, Matsumoto R, Takahashi R, Ikeda A: Temporal change of electroencephalogram in benign adult familial myoclonus epilepsy (BAFME): a case report: the 12th Asian&Oseanian Epilepsy Congress (2018/6/28-7/1, Bali, Indonesia).

35. Kajikawa S, Kobayashi K, Daifu M, Matsuhashi M, Hitomi T, Yamao Y, Kikuchi T, Yoshida K, Kunieda T, Matsumoto R, Takahashi R, Ikeda A: Ictal direct current shifts can be intracranially recorded even with time constant 2 seconds: a case report: the 12th Asian&Oseanian Epilepsy Congress (2018/6/28-7/1, Bali, Indonesia).

国内学会 Domestic presentations

〈英語発表 English Presentations〉

36. Daifu M, Matsumoto R, Shimotake A, Sakamoto M, Ota M, Kunieda T, Miyamoto S, Takahashi R, Lambon Ralph MA, Ikeda A: Ventral part of the anterior temporal lobe actively engages in Kanji reading: Evidence from direct cortical stimulation of the basal temporal language area. 第39回日本神経科学大会（2016/7/20-22，横浜）.

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40. 池田昭夫：てんかんの診断・治療と最近の研究動向（グリアと Red slow）．Epilepsy Forum in Niigata －meet the experts－（2018/1/25，新潟）．

41. 松本理器：実地診療における抗てんかん薬の使い方ーペランパネルの可能性を含めてー．Neurology Conference（2018/1/17，宇都宮）．

42. 松本理器：脳機能マッピング．ふじさん・てんかん脳波ハンズオンセミナー（2018/1/28，熱海）．

43. 松本理器：ビデオから学ぶ　てんかんの診断と治療．Dementia and Epilepsy Expert Meeting（2018/1/30, 東京）．

44. 池田昭夫：てんかんの診断・治療の基本：新規抗てんかん薬のミッション．第42回群馬てんかん懇話会（2018/2/23，群馬）．

45. 松本理器：てんかん実地診療での診療と治療．第110回京都実地医家の会（2018/2/24，京都）．

46. 松本理器：てんかん病態 update. システム脳科学からのアプローチ. 第34回奈良小児てんかん研究会（2018/2/15，橿原）．

47. 池田昭夫：てんかんの病態生理：ニューロンからグリアまで．第46回香川発達神経研究会・学術講演会（2018/3/3，高松）．

48. 松本理器：高齢者てんかんの診断と治療 update．高齢者てんかん講演会（2018/3/7，岡山）．

49. 松本理器：ビデオ脳波で学ぶてんかんと重積状態．第5回千日前神経カンファレンス（2018/3/22，大阪）．

50. 十河正弥，松本理器，下竹昭寛，小林環，菊池隆幸，吉田和道，國枝武治，宮本享，髙橋良輔，池田昭夫：「行為」における陰性運動野の役割：高頻度皮質電気刺激を用いた検討．第8回京都脳機能セミナー（2018/7/9，京都）．

VI Attached materials

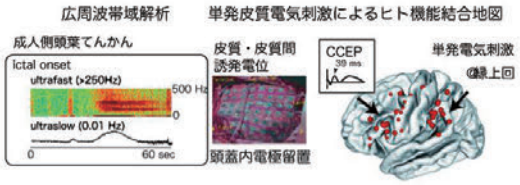
Collaborative research activity in the Grant-in-Aid for Scientific Research on Innovative Areas: Non-linear Neuro-oscillology - Towards Integrative Understanding of Human Nature.

This five-year innovative research program is led by Prof. Atsushi Nambu (National Institute for Physiological Sciences, Division of System Neurophysiology) and aims to create a new academic field of Neuro-oscillology, which enables us to understand human nature. We will devote ourselves to researches on wideband-EEG oscillations to understand the human nature and network diseases such as epilepsy (Research Project A03: Principal Investigator Akio Ikeda) and to collaboration with the researchers of other fields including mathematical modeling, intervention and Exploration groups.

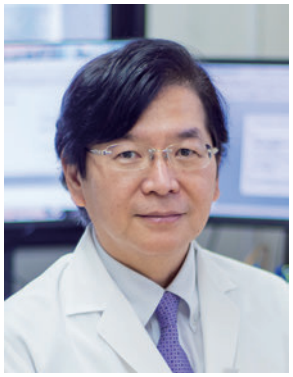
Homepage: http://www.nips.ac.jp/oscillology/

A03 ヒト脳発振現象の直接記録

ヒト脳機能は多次元・多階層の発振現象の非線形的相互作用により発現する。一方、脳機能の異常発現も作動原理の根本は共通し、てんかんは、自律的な脳ネットワークが突発的に種々の次元・階層で過剰発振する「ネットワーク病」と捉えられる。本研究計画では、正常脳機能およびてんかん発作発現にかかわる局所および広域の集団発振現象をヒト脳からの直接記録で探索する。



空間的観点からは、局所神経回路(細胞外多電極記録)からシステムレベル(皮質脳波、頭皮上脳波、脳磁図)で、発達過程の観点からは、ヒトの乳児・小児・成人脳および動物モデルで比較検討する。B班と連携し、記録データからの数理モデルを構築し、正常振動現象および病態下の異常発振の作動原理と制御機構の解明を目指す。C班と連携し、外的および内的な振動制御の手法を用いて、突発性振動異常の制御を試み、介入による多次元・多階層での生理的・病的振動の変容機構を明らかにする。



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研究協力者	小林勝哉 京都大学大学院 医学研究科 臨床神経学

HP: http://epilepsy.med.kyoto-u.ac.jp/

Hands-on seminar at the 3rd conference of oscillology

The 3rd conference of oscillology was held at Ibaraki campus of Ritsumeikan university in January 6th to 8th 2017. As the new approach to facilitate collaborative research, hands-on seminar was held. In the morning session of this seminar, research group A03 (principal investigator Akio Ikeda) provided the real data of electrocorticography (ECoG) recorded at Kyoto university hospital, and helped the participants to analyze ECoG during epileptic seizures or cognitive tasks.

Hands-on seminar

International symposium of oscillology

International symposium of oscillology 'Neural oscillation conference 2017: Problems of consciousness and neuropsychiatric disorders as network diseases' was held from June 16th to 18th 2017 in Tokyo university. Prof. George Northoff (University of Ottawa, Canada) provided us the lecture open to the public ('The spontaneous brain - Key to our self and consciousness?').

Panel discussion at International symposium of oscillology

Participants of International symposium of oscillology

Pre-congress and Post-congress of the 51th annual meeting of Japan Epilepsy Society

Akio Ikeda was the president of the 51th annual meeting of Japan Epilepsy Society (JES) held at November 3th to 5th 2017. Pre-congress and Post-congress were held cosponsored by JSPS Grant-in-Aid for Scientific Research on Innovative Areas "Neuro-oscillology".

・Pre-congress:

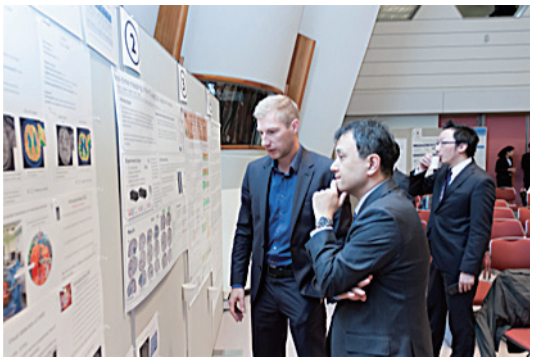
As pre-congress, hand-on seminar for EEG analysis was held. (http://www.c-linkage.co.jp/jes51/hanson.html). This seminar was cosponsored by JSPS Grant-in-Aid for Scientific Research on Innovative Areas "Neuro-oscillology", Japan Agency for Medical Research and Development (AMED) 'Investigation of glia function in intractable epilepsy and creation of clinical guideline', NIHON KOHDEN Co., Miyuki Giken Co.. In the 1st part 'Basic knowledge of EEG analysis for the clinician', the lecturers overviewed the broad-band EEG analysis, especially the analysis of DC shift and high frequency oscillation (HFO) during epileptic seizure, and dense array EEG. In the 2nd part 'Hand-on of analysis of DC/HFO during epileptic seizure', the participants analyzed the real EEG data of epilepsy patients.

・Post-congress:

As the post-congress symposium, 'Advanced ECoG/EEG Analysis in Epilepsy' was held cosponsored by Japan Epilepsy Society, JSPS Grant-in-Aid for Scientific Research on Innovative Areas "Neuro-oscillology", gTech Co., NIHON KOHDEN Co., Miyuki Giken Co., Unique Medical Co., Ltd., (http://www.c-linkage.co.jp/jes51/program.html#postcongress). The objective of this symposium was to facilitate the collaboration between the basic scientists and clinicians for the investigation of epilepsy pathology and normal brain function. Prof. Jean Gotman (MNI, Montreal, Canada), Peter Brunner (Wadsworth Center, Albany, NY, USA), and Prof. Kyosuke Kamada (Department of neurosurgery, Asahikawa Medical University) were invited as the lecturer for the symposium.

Pre-congress

Post-congress: the lecture of Prof. Jean Gotman



Post-congress: Poster presentation

Art Exhibition and 'Oscillation Cafe' in the 51th annual meeting of Japan Epilepsy Society

Art exhibition about epilepsy (sponsored by the 51th annual meeting of Japan Epilepsy Society) was held at the Kyoto University Museum at November 1st 2017. 'Oscillation' Café was also held in the same day.

Art Exhibition about Epilepsy

Oscillation Café

11th electroencephalography (EEG) and electromyography (EMG) seminar

January 20th, 2018, Kyoto University

The 1st EEG and EMG seminar was held in February 2008 in Kyoto in order to acquire and improve the basic knowledge and techniques of clinical neurophysiological studies. From the 2nd EEG and EMG seminar, this seminar became a training session related to Japanese Society of Clinical Neurophysiology. Since then, the seminar has been held every winter in Kyoto. Our department served as the secretary office of this seminar. About 150 participants attended comprehensive lectures and hands-on about clinical neurophysiological studies.

11th electroencephalography (EEG) and electromyography (EMG) seminar

3rd advance course of electroencephalography (EEG) seminar

July 29th-30th, 2017, Shirankaikan and Shirankaikan Annex

The advance course of electroencephalography (EEG) seminar was founded by Japanese Society of Clinical Neurophysiology (A committee of advance course of electroencephalography (EEG) seminar: Chair Akio Ikeda) in order to acquire specialized knowledge and technique about clinical EEG. The seminar adopted ANZAN (Australian-New Zealand Association of Neurology) style which consists of 8 sessions, and each session consists of lecture (30 min) followed by practical hands-on related to lecture (60 min). About 50 participants deepened their knowledge about recording and reading of clinical EEG.
EEG samples were prepared by the courtesy of ANZAN (Prof. Andrew Bleasel, Prof. Earnest Somerville, Prof. John W. Dunne, and Prof. Nicholas Lawn).

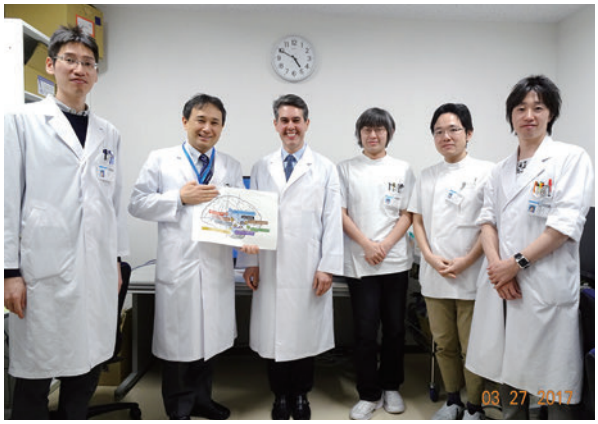
3rd advance course of electroencephalography (EEG) seminar

Special Lecture (～ June, 2018)

Lecturer：Michel Le Van Quyen
Affiliation：INSERM,
Title：High-Frequency Oscillations as a New Biomarker in Epilepsy (Mini-symposium of HFO and Oscillology)
Sponsor：JSPS Grant-in-Aid for Scientific Research on Innovative Areas “Neuro-oscillology”
Date：November 9th, 2016
Venue：Shirankaikan Annex

Special lecture of Prof. Michel Le Van Quyen

Lecturer：Jorge Gonzalez-Martinez
Affiliation：Cleveland Clinic Epilepsy Center
Title：Modulating Large-Scale Epileptic Networks: A plea for less invasive Epilepsy Surgery
Date：March 27th, 2017
Venue：Kyoto University Hospital
Sponsor：Department of Neurology, Department of Epilepsy, Movement disorders and Physiology, Kyoto University school of Medicine



Special lecture of Dr. Jorge Gonzalez-Martinez

Lecturer：Prof. Christophe Bernard

Affiliation：INSERM, Director of Research

Title：Epilepsy: complexity is the solution

Sponsor：Department of Epilepsy, Movement disorders and Physiology, Kyoto University school of Medicine

Date：June 15th, 2017

Venue：Kyoto University Hospital

Special lecture of Prof. Christophe Bernard

Lecturer：Stéphanie Baulac

Affiliation：INSERM

Titile：Epilepsies related to the mTORC1 signalization cascade

Sponsor：Department of Epilepsy, Movement disorders and Physiology, Kyoto University school of Medicine

Date：July 18th, 2017

Venue：Kyoto University Hospital

Special lecture of Stéphanie Baulac

Lecturer：Prof. Marco Catani

Affiliation：King's College London

Title：Tracking New Paths in the Human Brain (7th Kyoto Brain Function Seminar)

Sponsor：Kyoto Brain Function Seminar, Eisai Co. Ltd.

Date：July 24th, 2017

Venue：Kyoto University Hospital

Special lecture of Prof. Marco Catani

Lecturer：Richard C. Burgess

Affiliation：Cleveland Clinic Epilepsy Center, USA

Title：The Role of Magnetoencephalography in the Evaluation of Patients with Complicated Epilepsy

Sponsor：Department of Epilepsy, Movement disorders and Physiology, Graduate school of Medicine, Kyoto University (Cosponsor：RICOH Co., Ltd.)

Date：June 13th, 2018

Venue：Kyoto University Hospital

Special lecture of Richard C. Burgess

Visiting physicians (～ June, 2018)

[Overseas]

August 25th, 2016
Prof. Matthew A. Lambon Ralph
Affiliation: University of Manchester, U.K.
Position: Professor

November 9th, 2016
Prof. Michel Le Van Quyen
Affiliation: Inserm Aix-Marseille Université, France
Position: Professor

January 28th - 30th, 2017
Michael Wagner
Affiliation: Compumedics Germany GmbH, Germany
Position: Senior scientist

March 27th, 2017
Dr. Jorge Gonzalez-Martinez
Affiliation: Cleveland Clinic Epilepsy Center, USA

June 15th, 2017
Prof. Christophe Bernard
Affiliation: Inserm Aix-Marseille Université, France
Position: Professor

July 24th, 2017
Prof. Marco Catani
Affiliation: King's College London, UK
Position: Professor

November 28th, 2017
Mario Valderrama
Affiliation: University of Los Andes, Colombia
Position: Assistant Professor

December 28th, 2017
Hisako Fujiwara
Affiliation: Cincinnati Children's Hospital Medical Center, USA
Position: Technologist

June 13th, 2018
Dr. Richard C. Burgess
Affiliation: Cleveland Clinic Epilepsy Center, USA
Position: Director of Magnetoencephalography Laboratory

[Domestic]

September 26th, 2016
Prof. Ichiro Tsuda, Ph.D.
Affiliation: Department of Mathematics, Hokkaido University
Position: Professor

September 26th, 2016
Takao Namiki, Ph.D.
Affiliation: Department of Mathematics, Hokkaido University
Position: Associate Professor

March 22th, 2017
Naoyuki Sato, Ph.D.
Affiliation: Future University Hakodate
Position: Professor

March 22th, 2017
Hiroaki Mizuhara, Ph.D.
Affiliation: Graduate schools of Informatics, Kyoto University
Position: Lecturer

April 19th, 2017
Miho Miyajima, Ph.D.
Affiliation: Tokyo Medical and Dental University, Graduate School of Medical and Dental Sciences, Medical and Dental Sciences, Comprehensive Patient Care, Liaison Psychiatry and Palliative Medicine
Position; Assistant Professor

17th May, 2017
Takashi Nagamine, M.D., Ph.D.
Affiliation: Department of Neuroscience, Sapporo Medical University
Position: Professor

September 27th, 2017
Hiroaki Wagatsuma, Ph.D.
Affiliation: Department of Human Intelligence Systems, Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology
Position: Associate Professor

November 20th, 2017
Kou Matsui, Ph.D.
Affiliation: Graduate School of Life Sciences, Super-network Brain Physiology, Tohoku University
Position: Professor

November 22th, 2017
Hiroki Tanaka, Ph.D.
Affiliation: Nara Institute of Science and Technology
Position: Assistant Professor

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Department of Epilepsy, Movement Disorders and Physiology
Kyoto University Graduate School of Medicine

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