P9-Reversible Suppression of Tyrosine Hydroxylase Expression Induced by Optical Inactivation of Substantia Nigra in the Intact Rats

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Objective: Therapeutic treatments for Parkinson's disease (PD) have been widely studied in the world, but the causes of PD remain unclear. We hypothesize that tonic GABA produced in astrocytes in the vicinity of substantia nigra may cause the early stage of PD progression via down-regulation of tyrosine hydroxylase (TH) expression. In this study, we tested the inhibitory effects of tonic GABA on dopaminergic neuron using the expression and illumination of halorhodopsin in substantia nigra pars compacta (SNpc) in the intact rats.

Methods: Thirteen male Wistar rats received a unilateral injection of concentration of adeno-associated viral vectors containing a human synapsin 1 promotor that drives expression of halorhodopsin from Natronomonas (NpHR) and YFP into right SNpc. The optic cannula was implanted into the ipsilateral SNpc at 3 weeks after viral injection. The rats were divided into three groups: pre-state (n=3), 24 hour light stimulation (n=4), and post-recovery groups (n=6). Stepping tests and cylinder tests were performed in three sequential steps: during light-off state, after 24 hour light stimulation, and 5 days after light stimulation. All rats were sacrificed to investigate TH expression as soon as the final behavioral tests were completed.

Results: Stepping tests revealed that optical inhibition of the SNpc significantly induced contralateral forelimb akinesia after 24 hour light stimulation, which was spontaneously recovered 5 days after light stimulation. Immunofluorescence revealed that TH expression of the ipsilateral SNpc was remarkably suppressed after 24 hour light stimulation, which was spontaneously reverted to intact state 5 days after light stimulation.

Conclusions: Tonic GABA of astrocytes may induce the down-regulation of TH expression in SNpc reversibly, leading to the early stage of PD progression. These findings are useful as a basis for future studies on causes of PD.

P10-Problems Associated with Occipital to C1-C2 Sublaminar Insertion of Paddle Leads for Spinal Cord Stimulation for Upper Extremity Pain

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Objective: While spinal cord stimulation (SCS) has commonly been carried out using percutaneous leads, these devices have limitations in cervical implants due to problems with positional stimulation and lead migration. Paddle leads, by virtue of their design, are more stable in their apposition to the neural elements; however, mid and lower cervical insertions have been associated with both acute and subacute spinal cord injuries. At C1-C2, the space around the spinal cord is more generous, and allows greater room for insertion of leads. Several studies indicated successful application of C1-C2 paddle leads for the management of chronic painful conditions of the upper extremities. The authors report our own experience of C1-C2 sublaminar paddle leads and discuss the problems and limitations related to this novel technique of SCS.

Methods: During last 2 years, 5 patients underwent trial of SCS through C1-C2 paddle leads insertion for the management of chronic painful conditions of the upper extremity. There were four men and one woman and the mean age was 50 years (range, 44-61). The cause of pain was: failed neck surgery syndrome (FNSS) (n=2), brachial plexus avulsion pain, CRPS type 2 with peripheral nerve injury (antebrachial cutaneous nerve), neuropathic pain from transverse myeltis. Their pain was refractory to maximal medical treatment including strong opioids, physical therapy, repeated blocks, and radiofrequency. The mean preoperative numerial rating scale (NRS) was 7.4 (range 7-9/10).

The insertion of the paddle leads was performed in routine occipital to C1 interspace under fluoroscopic guidance and intraoperative monitoring of motor evoked potentials (MEP) and SSEP. The location of the paddle leads were verified both intraoperatively and postoperatively with fluoroscopy and X-rays. Trial stimulation was given 3 to 7 days after insertion of the paddle leads, and mapping of stimulation-induced paresthesia and pain reduction were recorded. If the patient was satisfied with trial stimulation and agree with more than 50% pain relief, the implantable pulse generator were implanted in the infraclavicular chest wall (both subpectoral and subcutaneous locations). The electrode was removed if results of trial stimulation was unsatisfactory. The patients with C1-C2 SCS implan-

tation were checked regularly one to three months interval at the outpatient clinic.

Results: Trial stimulation via C1-C2 sublaminar paddle leads successfully controlled the upper extremity pain and allodynia in four patients and could not control the neuropathic pain from transverse myeltis. Among 4 patients with successful trial stimulation, three patients had the IPGs implanted. In one patients could not tolerate the stimulation-induced paresthesia in the suboccipital and chin which was elicited by concomitant stimulation of C2, 3 roots and the electrode was replaced in posterior C34 epidural space through small posterior laminectomy with successful control of arm pain. Indeed, Paresthesia in the subocciptial area and lower face in addition to control of the upper extremity pain was observed in all patients with C1-C2 paddle SCS trial, and that was tolerable in 2 patients with chronic stimulation with adjustment of the stimulation parameters.

One patient lost stimulation-induced-paresthesia after one year despite of successful control of the arm pain and exploration with revision was performed and the other patient with chronic pain of BPA also lost analgesic effect of stimulation-induced-paresthesia with aggravation of the arm pain in 6 months after SCS. The electrode was removed and the aggravated arm pain disappeared in three months after explantation of the hardware. In the long-term follow-up of 2 years, only one patients (bilateral arm pain from FNSS) is using C1-C2 sublaminar paddle SCS (with 50% pain relief, NRS 3-4/10).

Conclusions: The discomfort of concomintant paresthesia in the suboccipital area and lower face and fading analgesic effect from chronic stimulation by C1-C2 stimulation was not reported in the literature regarding occipital to C1-C2 SCS. Although stimulation of high cervical C1-3 roots has a potential for application for control of cervical neuralgia and facial pain, this could be an another factor in successful trial stimulation by C1-C2 paddle stimulation for management of the upper extremity pain. Furthermore, the fading analgesic stimulation-induce paresthesia should be noted.

P11-5 Column-array Paddle Lead in Spinal Cord Stimulation

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Objective: Spinal cord stimulation is a safe, reversible, efficacious treatment option for selected patients with medically intractable chronic pain syndromes such as failed back surgery syndrome (FBSS) and complex regional pain syndrome (CRPS). Although the implantation of SCS system with percutaneous leads is less invasive, paddle-style SCS has several advantages; less chance of lead migration and positional effect, more constant coverage of painful areas with more favorable clinical outcomes than that of percutaneous lead SCS. The structure and configuration of paddle lead has been adjusted to deliver more reliable and consistent coverage of painful area in complex pain patterns. Recent introduction of three and five-column array provided an effective chance of covering painful area in complex pain syndrome such as FBSS. We report the pattern of paresthesia coverage provided by 5 column-array paddle leads in SCS.

Methods: Five column-array paddle lead (PentaTM,St. Jude Medical, Plano, Texas) was used to treat the complex pain in the extremity and low back (n=7). The cause of pain was; FBSS (n=5), failed neck surgery syndrome (n=1), CRPS type II with causalgia (n=1), central poststroke pain (CPSP). For management of pain in the low back and legs, 5 column paddle leads were placed at the level of T9, and they were placed at the level of C4 and C1-C2 sublaminar space for control of arm pain. In one case of FBSS, 5 column paddle lead was used for replacement of cylindrical lead to restore stimulation-induced paresthesia in painful area.

Results: Trial stimulation with 5 column paddle leads was successful in covering complex painful areas in low back and extremities. Severe allodynia was alleviated significantly in 2 patients and all patients (n=7) passed trial stimulation for chronic stimulation. IPGs (Eon-miniTM rechargeable, St. Jude Medical) was implanted in the right lower quadrant and subclavicular chest wall. The stimulation mapping of paresthesia production was generated and will be displaced for further reference. Compared with paresthesia production by 3 column electrode (Specify 5-6-5, or Tripole 16), the area covered by one contact (monopolar or bipolar stimulation) was rather small, however, the coverage of painful area was possible with combination of multiple stimulation (1-3 combinations).

Conclusions: 5 column-array paddle leads was useful in coverage of painful areas with complex back and leg pain and the success rate of trial SCS was higher.

P12-Simultaneous Stimulation on Dorsal Root Ganglion and Dorsal Column for CRPS Patient; A Case Report

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Objective: The goal of this stimulation was to assess the efficacy of interaction between spinal cord stimulation (SCS) and dorsal root ganglion (DRG) stimulation for the type-1 complex regional pain syndrome patient (CRPS).

Methods: This 45-year-old man had severe dysesthetic pain (VAS=9) on left arm. And this pain was covering near whole arm which was advent about 3 months after his shoulder operation. Various methods of pain modality were used, but failed to improve his symptoms.

Results: Trial SCS was inserted using percutaneous lead. During trial period, about 70% was covered with stimulation but remnant 30% was also bothersome to the patient. So we replaced the percutaneous lead to surgical paddle type lead and put the previous lead in the left C6 DRG. During second period of stimulation, patient felt much better for the dual stimulation program which was covering his pain almost 90% with VAS 3. Implantable programmable generator was inserted and dual stimulation was continued.

Conclusion: Alternative neuromodulation technique, such as DRG stimulation, could allow the physician to select more proper and efficient methods for the challenging pain patients.

P13-The Relation Between Fornix Injury and Memory Impairment in Patients with Diffuse Axonal Injury

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Little is known about the relation between fornix injury and memory impairment in diffuse axonal injury (DAI). In the current study, we attempted to investigate fornix injury in patients with memory impairment following DAI, using diffusion tensor imaging (DTI). Nine patients with DAI and nine age- and sex-matched control subjects were recruited. The DTIs were acquired using a sensitivity-encoding head coil on a 1.5 T. Five regions of interest (ROI) were drawn manually on a color fractional anisotropy (FA) map: two ROIs for each column, one ROI for the body, and two ROIs for each crus. The FA and apparent diffusion coefficient (ADC) were measured in each of the ROIs. Cognitive function was evaluated using the Memory Assessment Scale, Wechsler Intelligence Scale, and Mini-Mental State Exam. In the DAI group, the FA value in the fornix body was significantly decreased compared with that of the control group. In contrast, we did not find significant differences in the column and crus of the fornix. Among all of the cognitive function scales, only the Memory Assessment Scale scores were significantly correlated with the FA values of the fornix body in the DAI group. We found that memory impairment in patients with DAI is closely related to neuronal injury of the fornix body among the three fornix regions that we assessed. DTI could be useful in the evaluation of patients with memory impairment following DAI.

P14-Anti-epileptic Drug (AED) Prophylaxis in Aneurysmal Subarachnoid Hemorrhage Patient Treated with Endovascular Coil Embolization

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Objective: The incidence and risk factor of seizures after aneurysmal subarachnoid hemorrhage (SAH), as well as the effect of antiepileptic drug (AED) prophylaxis and the influence of treatment modality for seizure, remain unclear. We conducted a systematic review of case series in the hope of furthe- ring understanding of effect of AED prophylaxis in endovascular coiling group

Methods: We conducted a prospective observational study of 76 patients who were managed by endovascular coil embolization after aneurysmal SAH between Jan. 2012. and Dec. 2013. We use AED (Levetiracetam 500 mg twice a day) for 1 week in patients with Fisher Grade 2, 3 and 4 weeks in Fisher Grade 4. The incidence of seizures was compared with published data, and logistic regression analysis of potential clinical associations was performed.

Results: The rate of onset seizure was 2.6% (2/76), and the rate of early, late postoperative seizure was 1.3% (1/76) in each. Early seizures was significantly lower than already reported data, rate of seizure in group not use prophylactic antiepileptic drug and clipping group.

Conclusion: Short term use of antiepileptic drug can reduce the risk of early and late seizure. We think that the short-term use of antiepileptic drug for aneurysmal subarachnoid hemorrhage patient who treated with endovascular coil embolization can reduce the early seizure.

P15-GK Surgery after Biopsy in the Simultaneous Day

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Objective: Brain biopsy is indicated for tissue diagnosis. GKS (gamma-knife radiosurgery) is needed brain tumors with large cyst after Ommaya's reservoir insertion in combined medical disease, old age, anticoagulant using patients. Some patient feels Lekesell frame application is very painful and terrible.

Methods: We treated GKS after stereotactic biopsy in the same day. The diagnosis was 3 metastasis, 1 lymphoma patients.

Results: After 6 months follow up, decreased tumor in 3 cases, new recur in one metastasis patient.

Conclusions: In old age, metastatic brain tumors patients with large cyst, biopsy or Ommya's reservoir inserted is necessary in diagnosis is uncertain. GK Surgery after biopsy in the simultaneous day is tried in combined medical disease, old age, anticoagulant using patients.