LBA1

Title: Functional Limitation and Rehabilitation of Parkinson's Disease: Occupational Therapy Intervention.

Author: Sarada Kumar Saha

Institution: Centre for the Rehabilitation of the Paralysed (CRP), Mirpur

Objectives:

To represent the functional limitations arises of person with Parkinson's disease (PD).

To explain Occupational Therapy interventions for the person with PD.

Introduction:

Parkinson's disease (PD) is a devastating neurodegenerative disease. In Parkinson's disease, the availability of dopamine is reduced over time. The patient with PD have Akinesia, Bradykinesia, tremor, rigidity etc. which leads functional limitations such as balance, walking, speech, handwriting, typing, fastening buttons, driving, and many other simple, or complex though familiar, routine activities, like playing a sport, or a musical instrument etc. As because of Dopamine has contribution to cognitive process, person with PD also arises problem in cognitive functions process such as maintain attention, motivation, mood, visual perception, decision-making and problem solving skills. The entire treatment process needs Multidisciplinary team (MDT) approach which involves Neurologist or Medical Doctors, Nursing care, Occupational Therapist, Physiotherapist, Speech Therapist, Social worker and dietitian. Occupational Therapist helps to find out the functional limitations and the best possible way to overcome it through the treatment and rehabilitation process.

Background: During the occupational therapy treatment session to the patient with PD, it was found that all patients have faced some difficulties in different functional performance like walking, feeding, dressing, writing, brushing teeth etc. So, as an Occupational Therapist, I would like to know more about the therapeutic intervention and rehabilitation process for those patients with Parkinson's disease.

Methods: This is a clinical discussion of my presentation about the functional limitations of patient with Parkinson's disease and Occupational Therapy intervention to rehabilitate or to minimize the difficulties for maximizes independence.

Results: This practice is evidence based and developed on basis of Bangladeshi culture. This clinical intervention becomes more helpful for the person with PD as well as their family members.

Conclusion

Person with PD have faced difficulties to perform their daily activities such as walking, dressing, shaving, writing, feeding even in their leisure activities due to the disease progression. As Occupational Therapist, it is the main key role to find out the functional limitation and given proper intervention to not only for regain but also for the restoration of current functional abilities to maximize independence in their daily living style. Finally, it is highly essential to provide occupational therapy service not only for the benefit of the person with PD but also for reduce of the family burden by maintaining coping strategies.

LBA2

Wilson's disease: update on integrated Chinese and Western medicine.

Wang XP.

Department of Neurology, Shanghai First People's Hospital, Shanghai Jiao-Tong University, Shanghai 200080, China.

Abstract:

Wilson's disease (WD), or hepatolenticular degeneration, is an autosomal recessive inheritance disorder of copper metabolism caused by ATP7B gene mutation. As WD is an inherited disease of the nervous system that is not curable; early diagnosis with early and life-long treatment leads to better prognoses. Currently, the recommended treatment for WD is integrated Chinese and Western medicine. A number of studies indicate that treatment of integrative medicine can not only enforce the de-copper effect but also improve liver function, intelligence, and other factors. This article reviewed in detail the advantages of WD treated with Chinese and Western medicine together.

LBA3

Title: Alpha-synuclein in minor salivary glands as peripheral biomarkers of sporadic Parkinson's disease

L.Y. Gao, T. Feng

Department of Neurology, Beijing Tian Tan Hospital, Capital Medical University, China

Objective: To confirm the presence or absence of Lewy pathology in the minor salivary glands of Parkinson's disease (PD) patients and evaluate the diagnostic value of minor salivary glands biopsy for the detection of PD.

Background: Finding a potential biomarker of peripheral nervous system may reduce the error rates of diagnosing PD at the time of symptom onset. Recently, it has been reported that Lewy-type α-synucleinopathy was present in the minor salivary glands.

Methods: We studied 13 PD cases, 2 Multiple System Atrophy (MSA) cases and 2 age matched controls. PD patients were evaluated with the Hoehn and Yahr stage and the Unified Parkinson's Disease Rating Scale motor scale. We performed immunohistochemical staining for Lewy-type alpha-synucleinopathy in minor salivary glands using antibodies against alpha-synuclein. All the samples with positive immunoreactivity were counterstained with hematoxylin to highlight the normal morphology of the minor salivary glands.

Results: Abnormal accumulation of alpha-synuclein can be found aroud the gland cells in 9 out of 13 PD patients, but none of the other subjects, including MSA patients and control sujects**.**

Conclusions: It is the initial results of our study that will last for 2 years. These results suggest that minor salivary glands biopsy may be a feasible bimarker of PD, and it may help us improve the clinical diagnostic accuracy of this disease.

T. Feng: the corresponding author,E-mail:happyft@sina.com

L.Y. Gao: E-mail:gaoliyan87@163.com

LBA4

Suppression of hand tremor at rest in Parkinson's disease but not dystonic hand tremor by electrical muscle stimulation: A Pilot study.

Onanong Jitkritsadakul, MD.[1], Chusak Thanawattano, PhD.[2] Chanawat Anan, BSc. [1], Roongroj Bhidayasiri, MD., FRCP.[1,3].

[1] Chulalongkorn center of Excellence on Parkinson's Disease & Related Disorders, Chulalongkorn University Hospital, Bangkok, Thailand.

[2] National Electronics and Computer Technology Center (NECTEC), Pathumthani, Thailand.

[3] Department of Neurology, Geffen School of Medicine at UCLA, Los Angeles, CA, United States.

Objective

This study is to determine the effectiveness of EMS in the reduction of rest tremor in PD and to evaluate if this feature can help distinguish rest tremor in PD from dystonic hand tremor.

Background

Rest tremor in Parkinson's disease (PD) often is a debilitating symptom and may or may not very well respond to dopaminergic medications. The pathophysiology of tremor could provide a basis for understanding the complex interaction between central and peripheral (local mechanical-reflex) mechanisms. Strong stimuli (such as electrical muscle stimulation) may reset the tremor by denervation of the peripheral reflexes mechanism.

Methods

This observational study compared the efficacy of EMS in the reduction of hand tremor at rest as evaluated by a tremor analysis device (The Motus Movement Monitor; MOTUS Bioengineering Inc., USA) in two periods: before and during EMS. 15 individuals with tremor predominant PD patients (PD) and 8 individuals with dystonic tremor from various causes (DT) shared the common trait of having a tremor, which was refractory to oral medications. The diagnosis of PD and DT were made from the established diagnostic criteria. Stimulation of the affected hand muscle was conducted with an EMS stimulator (Intensity™ Twin Stim® III) and the 1.5" *1.5" self-adhering electrodes will be placed at 2 sites, one over the thenar eminence, and another one over the adductor pollicis muscle. The pulse amplitude was determined by the maximum setting tolerated that could induce tetanic muscle contraction without pain. Tremor parameters included the peak magnitude, RMS rate, Frequency and Q dimension score in both before EMS and during EMS for each patient as described in a previous literature.

Results

There were no statistically significant differences in gender, disease duration, the side of tremor predominance, and TMSE scores between the two groups. All subjects were instructed to take their regular medications before their tests in order to determine additional efficacy from EMS. Before EMS, PD tremor had significant higher peak magnitude (p=0.001) and RMS rate

(p=0.004) than the DT group (Table 1). Similar findings were also observed during stimulation (p=0.034, 0.047, respectively). There were no differences between maximum pulse amplitude, Q dimension scores, and tremor frequency in both before and during stimulation between the two groups. Moreover, the percentage in tremor reduction, calculated from differences of peak magnitude, was significantly higher in the PD group than the DT group (p=0.034). In comparing tremor parameters (peak magnitude, RMS rate, and Q dimension score) between before and during stimulation tests in each group (Table 2), we found significant improvement in each tremor parameters in the PD group ($p< 0.05$ each), whereas no significant improvement in any modality was observed in the DT group ($p \geq 0.05$ each).

Conclusion

In our study, we demonstrated the efficacy of EMS in the suppression of parkinsonian tremor, but not dystonic hand tremor. This result supports the role of peripheral reflex mechanism in the modulation of tremor in PD (Figure 1). While the exact mechanism is unclear, EMS may be able to suppress tremor by serving itself as strong peripheral stimuli to reset the central oscillatory threshold in the generation of tremor, or EMS may provide persistent tetanic contraction of the hand muscles (causing 'dystonia-like' hand posture) masking the underlying tremor. Our pilot study should be further expanded to include larger number of samples to explore a possible therapeutic role of EMS in suppressing tremor in PD, especially patients with medically intractable tremor.

Reference

1. Hallett, M. (1998). Overview of human tremor physiology. *Mov Disord, 13 Suppl 3*, 43-48.

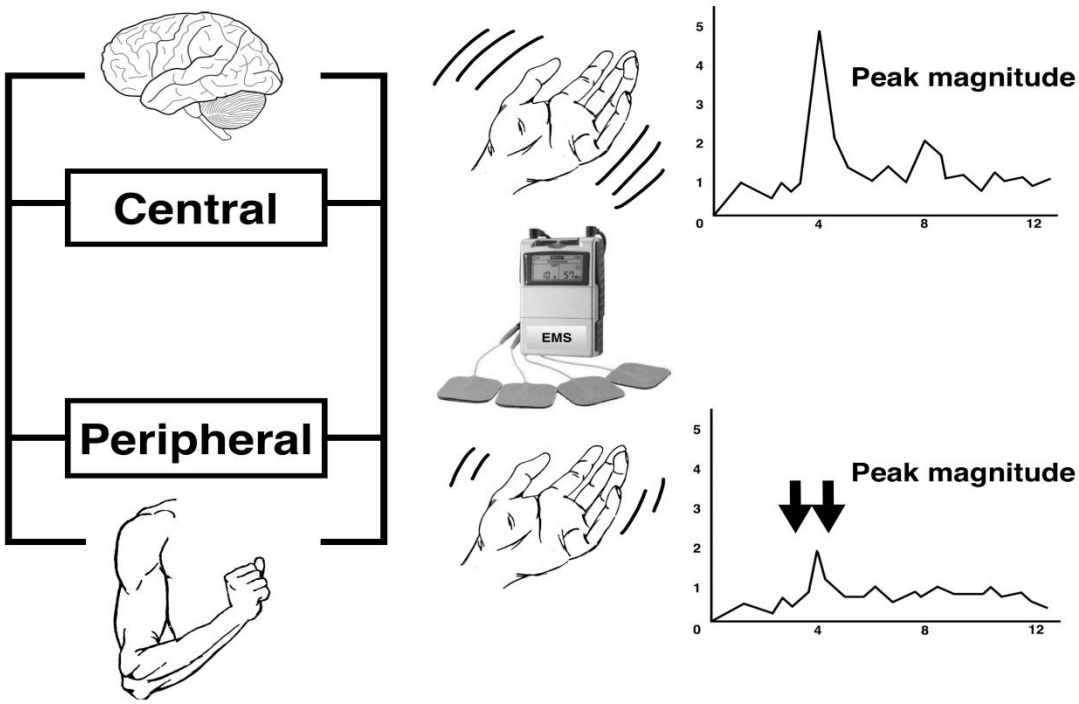
2. Deuschl, G., Raethjen, J., Lindemann, M., & Krack, P. (2001). The pathophysiology of tremor. *Muscle Nerve, 24*(6), 716-735.

3. Deuschl, G., Bain, P., Brin, M. (1998). Consensus statement of the Movement Disorder Society on Tremor. Ad Hoc Scientific Committee. *Mov Disord, 13 Suppl 3*, 2-23.

4. Bhidayasiri, R., Petchrutchatachart, S., Pongthornseri, R., Anan, C., Dumnin, S., Thanawattano, C. (2014). Low-cost, 3-dimension, office-based inertial sensors for automated tremor assessment: technical development and experimental verification. *J Parkinson Dis, 4(2)*, 273-282.

5. Zhang, D. G., Poignet, P., Widjaja, F., & Ang, W. T. (2011). Neural oscillator based control for pathological tremor suppression via functional electrical stimulation. *Control Engineering Practice, 19*(1), 74-88. doi: Doi 10.1016/J.Conengprac.2010.08.009

Figure 1. The pathophysiology of tremor and the propose mechanism for tremor reduction with EMS



LBA5

Access to Care from Neurologists and Subspecialists in Movement Disorders: An analysis of Travel Distance by Patients from the Thailand PD Registry Database.

Roongroj Bhidayasiri, MD, FRCP, FRCPI.[a,b] Onanong Jitkritsadakul, MD, MSc.[a] Natnipa Wannachai, MSc.[a] Lalita Kaewwilai, MSc.[a] Kamolwan Boonpang, BNS.[a]

[a]Chulalongkorn Parkinson's Disease and Related Disorders Center of Excellence. Chulalongkorn University Hospital, Bangkok 10330 Thailand.

[b]Department of Neurology, David Geffen School of Medicine at UCLA, Los Angeles, Calif., USA

Background

The evidence clearly encourages Parkinson's Disease (PD) patients to access care by neurologists or subspecialty clinicians in Movement Disorders every 3-6 months in order to discuss and control their symptoms. According to data from the Neurological Society of Thailand, there are approximately 300 board-certified neurologists in Thailand and they are concentrated in the large cities like Bangkok, Chiangmai, etc. PD patients who want care from a neurologist generally have to travel long distances to see them. With the current emphasis on the role of the family in the care of the patient, it is now common for the caregiver to participate in the appointment with the neurologist which, of course, means that she/he needs to travel long distances for the patient's care also. This impediment to care needs to be evaluated extensively and solutions need to urgently be put in place.

Objective

The aim of this study was to determine the distance that PD patients had to travel to see neurologists or subspecialty clinicians in Movement Disorders.

Methods

The nationwide PD registry database in Thailand, described in a previous article,[1] was used to analyze the travel distances for PD patients to see a neurologist or a certified subspecialty clinician in Movement Disorders. The travel distances were calculated based on the following 3 methods: 1) the distance between provinces via Google using http://www.4x4.in.th/tchangwat.html as the data provided by the Department of Highways, Ministry of Transport; 2) the distances within the same provinces via http://www.panteethai.com/distance_city.php used the average distances between the center of each province to each district; and 3) the distance within Bangkok via https://maps.google.co.th/maps/ which used the average distance estimated from the center of

each province to each of the districts. The distance per year was calculated assuming that individual PD patients travelled every 3 months to see the neurologists or subspecialty clinicians.

Figure 1: Map of the neurologists in Thailand

Results

There were 2,787 PD patients who chose access to care by neurologists or subspecialty clinicians from August 2010 through 15 Aug 2014. The characteristics of PD patients are shown on Table 1. The average distance traveled per year to see the neurologists or subspecialty clinicians was 805.06 Km, about the distance from Bangkok to Chiangrai as the farthest province in the north. The fastest way to travel is by airplane and the cost of airfare is approximately 2,395-5,632 THB (74.6-175.5 USD) for a single trip in economy class and it would take around 1 hour and 20 minutes. Another convenient way is by bus and the cost is around 405-980 THB (12.6-30.5 USD) depending on the type of the bus but it would take 13 hours.

Conclusion

The population of the elderly has dramatically been increasing and will double by 2030 as projected by United Nations. At that time people age >65 will be 1 billion.[2] Therefore the number of PD patients will increase accordingly. As the result showed that the burden on specialist in taking care of PD patients has increased, a urgent national policy should be implemented in order to distribute the neurologists to the outreach areas across the country or set up appropriate sites to provide care to PD patients.

Reference

1. Bhidayasiri R, Wannachai N, Limpabandhu S, et al. A National Registry to Determine the Distribution and Prevalence of Parkinson's Disease in Thailand: Implications of urbanization and Pesticides as Risk Factors for Parkinson's Disease. Neuroepidemiology 2011; 37: 222–230.
2. United Nations (2014). Probabilistic Population Projections based on the World Population Prospects: The 2012 Revision. Population Division, DESA. ST/ESA/SER.A/353. http://esa.un.org/unpd/ppp/

2

Table 1: The Characteristics of PD Patients and the estimated Travel Distance per Year (n= 2,787)

Characteristics	Mean (SD)	N (%)	Range
Male		1, 417 (50.8)	
Female		1,370 (49.2)	
Age (yr)	71.5 (11.6)		25-107
Duration of PD (yr)	10.8 (5.1)		
Live in Bangkok and vicinity		1,877 (63.7)	
Live in other 6 parts in Thailand		910 (36.3)	
Estimated Travel Distance per year (Km)	805.1 (SE,26.5)		120-9,192
Travel Distance per year			
Less than 200 Km		1,213 (43.5)	
201-500 Km		683 (24.5)	
501-1000 Km		432 (15.5)	
More than 1000 Km		459 (16.5)	


Map of the Neurologists
in Thailand

LBA6

Olfaction and Neuropsychiatric Symptoms in Early Parkinson's Disease

Jin Yong Hong,[a] Mun Kyung Sunwoo,[b] Jee Hyun Ham,[c] Jae Jung Lee,[c] Phil Hyu Lee,[c,d] Young H. Sohn.[c,*]

[a] Department of Neurology, Yonsei University Wonju College of Medicine, Wonju, Korea

[b] Department of Neurology, Bundang Jesaeng General Hospital, Seongnam, Korea

[c] Department of Neurology and Brain Research Institute, and [d] Severance Biomedical Science Institute, Yonsei University College of Medicine, Seoul, Korea

Background and objective: Olfactory and emotional dysfunctions are very common in patients with Parkinson's disease (PD). Olfaction and emotions share common neuroanatomical substrates. Therefore, in this study, we evaluated the association between olfactory dysfunction and neuropsychiatric manifestations in patients with PD.

Methods: PD patients who had been assessed for their olfactory function and neuropsychiatric symptoms were included. A logistic regression analysis was performed to evaluate the association between low olfaction and different neuropsychiatric symptoms.

Results: The patients with low olfaction (cross cultural smell identification test score $\leq$ 6) showed a higher prevalence of apathy when compared with those with high olfaction, whereas the frequencies of other neuropsychiatric symptoms were comparable between the two groups. A multivariate logistic regression analysis revealed that the presence of apathy/indifference (odds ration [OR] = 2.859, p = 0.007), age 70 years or more (OR = 2.281, p = 0.009), and the male gender (OR = 1.916, p = 0.030) were significantly associated with low olfaction.

Conclusions: Our results demonstrate that apathy/indifference is a unique neuropsychiatric symptom associated with olfactory dysfunction in PD. The findings also suggest that PD patients with low olfaction have a high prevalence of apathy.

LBA7

Determinates of Social Stigma in Parkinson's Disease: A Data Analysis from the Thailand PD Registry Database.

Roongroj Bhidayasiri, MD, FRCP, FRCPI.[a,b], Natnipa Wannachai, MSc.[a], Onanong Jitskritsadakul, MD.[a], Lalita Kaewwilai, MSc.[a], Kamolwan Boonpang, BNS.[a]

[a]Chulalongkorn Parkinson's Disease and Related Disorders Center of Excellence. Chulalongkorn University Hospital, Bangkok 10330 Thailand.

[b]Department of Neurology, David Geffen School of Medicine at UCLA, Los Angeles, Calif., USA

Background

The stigma of Parkinson's disease (PD) has been linked to the quality of life as measured by instruments such as the Parkinson Disease Questionnaire 39 (PDQ-39) or short form PDQ-8. Little information has been assessed regarding the factors influencing social stigma in PD patients.

Objective

The aim of this study was to identify the factors likely to contribute to social sigma in PD patients.

Methods

Data were reviewed on PD patients who were regularly seen by board-certified neurologists from the establishment of the nation-wide PD registry database between August 2010 and Aug 2014. The details of the questionnaire and the development of the registry were described in the previous literature.[3] The following factors were assessed as independent variables that may predict social stigma: A) age at registry; B) age at onset; C) female sex; D) duration of PD; E) tremor; F) postural instability; G) rigidity; H) bradykinesia; I) more than one motor symptoms; J) presence of motor fluctuations (wearing-off, dyskinesia, and on-off fluctuations) K) levodopa usage; L) dopamine agonist usage; M) COMT inhibitor usage; N) MAO-B inhibitor usage; O) anticholinergics usage; and P) more than 2 groups of antiparkinsonian medications. The logistical regression was applied to evaluate this dataset and the statistical significance was P value <0.05.

Results

2,787 PD patients in the Thai PD Registry Database were under the care of board-certified neurologists and 69.8% complained social stigma. The characteristics of these PD patients were

listed in Table 1. The following factors significantly contributed to social stigma, including postural instability, rigidity, and presence motor fluctuations with the odds ratio of 1.51, 1.95, and 1.69 respectively (Table 2).

Conclusion:

PD patients who had predominant postural instability and rigidity and had motor fluctuations were more likely to have social stigma. Patients with these characteristics would benefit from participating in social support groups. It is recommended that the national policy for the multidisciplinary management of PD should firstly aim at supporting those patients who are at-risk of having social stigma related to PD.

This study had the limitation of not considering nonmotor symptoms as they were not specified in the original questionnaires of the PD registry. Thus, further studies should link not only motor symptoms but should also include a range of nonmotor symptoms in the analysis.

Reference

1. Bhidayasiri R, Wannachai N, Limpabandhu S, et al. A National Registry to Determine the Distribution and Prevalence of Parkinson's Disease in Thailand: Implications of urbanization and Pesticides as Risk Factors for Parkinson's Disease. Neuroepidemiology 2011; 37: 222–230.

Table 1: The Characteristics of PD Patients (n= 2,787)

Characteristics	Mean (SD)	N (%)	Range
Male		1, 417 (50.8)	
Female		1,370 (49.2)	
Age (yr)	71.5 (11.6)		25-107
Duration of PD (yr)	10.8 (5.1)		
Social Stigma		1,944 (69.8)	

Table 2 Logistic Regression analysis: Odd Ratio of the Independent Variables contributing to Social Stigma

Independent Variables	Odd Ratio (95%CI)	P value
Postural Instability	1.51 (1.23-1.85)	<0.001
Rigidity	1.95 (1.57-2.42)	<0.001
Motor Fluctuation	1.69 (1.36-2.09)	<0.001

The Equation:

Ln [Odd] = .157 +.412 Postural Instability + .667 Rigidity + .523 Motor Fluctuation

LBA8

The effects of subthalamic nucleus deep brain stimulation on cognitive function in patients with Parkinson's disease

Bin Wu[1], Xiao-Wu Hu[2], Rong Wu[1], Chen Chen[1], Xiao-Ping Wang[1,CA]

Department of Neurology, Shanghai First People's Hospital, Shanghai Jiao-Tong University, Shanghai, China 200080

Objective: To follow up the patients with Parkinson's disease (PD) who underwent subthalamic nucleus(STN) by deep brain stimulation (DBS) therapy and compare the changes of cognitive function before and after this functional surgery, and to study the correlative factors and investigate the relationship between basal ganglia and memory.

Methods: The authors set up a series of battery of clinical tests including Unified Parkinson's disease rating scale (UPDRS) Ⅱ & Ⅲ, Hoehn & Yahr stage(H-Y stage), Mini mental state examination (MMSE), Wechsler memory scale(WMS), Serial reaction time task (SRTT), Degraded picture naming(DPN), Verbal fluency(VF), Clock drawing test (CDT) to measure the performance of both clinical characteristics and cognitions 1 week before and 12 months after STN-DBS operation in 20 PD patients, matched with 20 healthy adults who just assessed by the neuropsychological tests for once.

Result: 1. The activity of daily life(UPDRS Ⅱ), motor manifestations (UPDRS Ⅲ)and disease condition (H-Y stage) were all significant improved no matter whether it was "on period" or 'off period' ($P<0.01$). **2**. In the test of WMS, the MQ score of PD patient (88.10±16.70) were significantly lower ($t=-3.187$, $P<0.01$) than the control group (100.9±6.45). **3**. SRTT results, the means of average response time(T_{avg}) of the control group, pre-operation and post-operation group were (1.09±0.32) s, (1.58±0.83) s and (1.62±0.83) s respectively. Compared with the control group, the T_{avg} of pre-operation group was statistically increased ($t=2.432$, $P<0.05$), and there was an increasing trend in the post-operation group, however, no statistically significant difference had been found between the two ($t=-0.835$, $P=0.705$). As to the comparison of the blocks within each group of PD, no changes were found (pro- $F=0.329$, $P=0.964$; post- $F=0.377$, $P=0.945$), by contrast, in the control group it had been proved to be statistically significant ($F=2.316$, $P<0.05$). the means of error rates of the control group, pre-operation and post-operation group were (4.84±42.65)%, (9.76±15.2) % and (13.41±11.10) % respectively, the control group was no different from pre-operation group ($t=1.388$, $P=0.173$) while significantly compared with post-operation group($t=3.225$, $P<0.01$). **4**. MMSE and DPN results, no significant benefits were obtained in the control group, pre-operation and post-operation group. In regard to VF, there was a statistically difference between control group and pre-operation group ($Z=-2.927$, $P<0.01$), and it was significantly worse after surgery ($Z=-2.469$, $P=0.014$). Respecting CDT, significant benefits were obtained in both pre-operation ($Z=-2.762$, $P<0.01$) and post-operation ($Z=-2.165$, $P=0.03$) group compared with control group.

Conclusions : To some extent, STN-DBS can affect the cognition of PD patients, such as lowing VF, improving visual-spatial function and attention, a decreasing trend of implicit memory and execution function. Explicit memory is partly disassociated with implicit memory. From cognitive perspective STN-DBS might be relatively accepted if the cognitive function of PD patients is normal or mild impaired preoperatively.

Key Words: Parkinson's disease; subthalamic nucleus; deep brain stimulation; cognitive function; mechanism

LBA9

Hemichorea and hemiballism in a patient with temporal-parietal lobe infarction after treatment with recombinant tissue plasminogen activator

Takenobu Murakami, Tomohiro Wada, Itaru Sasaki, Kenji Yoshida , Mari Segawa, Suguru Kadowaki, Akioh Yoshihara, Shunsuke Kobayashi, Akihiko Hoshi, Yoshikazu Ugawa

Department of Neurology, Fukushima Medical University

Objective: We report transient hemichorea and hemiballism caused by a lesion in the temporal-parietal lobe.

Background: Hemichorea and hemiballism are often observed in patients with a stroke lesion at subthalamic nucleus (STN). We have experienced a patient presenting with transient hemichorea and hemiballism who had no lesions in STN.

Patient and Results: A 72-year-old woman admitted to our hospital when she suddenly had left hemiparesis. Neurological examination revealed disorientation, right conjugate deviation of the eyes and dysarthria. She had left hemiparesis and disturbance of all sensation in the left extremities. Brain magnetic resonance imaging (MRI) showed acute cerebral infarction in the right temporal-parietal lobes perfused by the middle cerebral artery (MCA). Atrial fibrillation was noted by electrocardiogram. We diagnosed her as cardio-embolic infarction, and then recombinant tissue plasminogen activator (rtPA) was administered within 3 hours after the onset of symptoms. On the same day, we observed ballistic involuntary movements in her left extremities. Follow-up brain MRI confirmed no lesions in the basal ganglia including STN and no changes in the lesion size. These involuntary movements persisted and finally disappeared on the ninth day. Her clinical symptoms were improved and she was transferred to another hospital for extensive rehabilitation.

Conclusion: This is a rare case of transient hemichorea and hemiballism due to cerebral infarction. We speculate that blockade of motor loop from cortex to basal ganglia by cerebral infarction would lead to the pathophysiology for the ballism, which was masked by corticospinal dysfunction in the acute phase but unmasked by pyramidal tract recovery induced with successful rtPA treatment on the later days.