Report on the international Primary Neurosurgical Life Support course in the eighth Asian Congress of Neurological Surgeons in Kuala Lumpur, Malaysia

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ABSTRACT

On November 22, 2010, a simulation-based hands-on education course for medical staff in the neurosurgical fields was held in 8th Asian Congress of Neurological Surgeons (ACNS) in Kuala Lumpur, Malaysia. The present education course called Primary Neurosurgical Life Support (PNLS) course had been started by the Japan Society of Neurosurgical Emergency since 2008. This report summarizes the international version of PNLS course in 8th ACNS.

Key words: Cerebral herniation, coma scale, clinical map, Primary Neurosurgical Life Support, simulation, stroke scale

Introduction

Management of the acute neurosurgical emergency patients represents one of the important clinical skill required for the neurosurgical staff. The goal of care for neurosurgical emergency diseases is to minimize brain damage and maximize patient recovery. Appropriate general managements should be needed before surgical treatment. Therefore, an education course should be necessary to learn the management. The Japan Society of Neurosurgical Emergency (JSNE) has developed and performed Primary Neurosurgical Life Support (PNLS) course as the educational course since 2008.[1,2] We performed the first trial PNLS and PNLS workshop in the 14th Annual Meeting of JSNE on January 16, 2009. After the trial, PNLS course was performed at Kansai Medical University on January 17, 2010, Tokai University on July 10, 2010, Kagawa University on October 16, 2010. We also performed PNLS workshop to train instructors at Kansai Medical University on August 16, 2009 and January 16, 2010, Nihon University on April 24, 2010. PNLS project was accepted as an official hands-on course and workshop in the 69th Annual Meeting of the JSNE on October 28 and 29, 2010. We performed not only Japanese version but also international version of PNLS course in the 9th International Conference of Cerebrovascular Surgery on November 12, 2009.[3] The PNLS project has been also accepted as an official program of the 8th Asian Congress of Neurological Surgeons (ACNS) in Kuala Lumpur, Malaysia, on November 22, 2010. The present PNLS course which was performed in 8th ACNS was an updated international version.

Design of the International PNLS Course

We designed subjective behavior objects as international version of PNLS course, such as 1) evaluation of consciousness level using coma scale, 2) evaluation of neurological conditions using stroke scale, 3) early detection and management of cerebral herniation, 4) learning of the representative neurosurgical cases [Table 1].

Module A: Coma scale

In this module, participants could learn to evaluate consciousness level using Glasgow Coma Scale (GCS).[4,5] and Emergency Coma Scale (ECS).[6-8] The GCS is internationally accepted when discussing patient’s consciousness level with other professionals. However, the GCS has the disadvantages of complexity especially in category of best motor response.[8] We introduced “Ajimi” performance to understand the category of best motor response.[9] The ECS was designed by Ohta in 2003 and developed by the JNE and JSNE.[8] The ECS consists of three major categories.

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depending on the severity of consciousness disturbance [Table 2]. Category 1 and 2 have two subcategories, and
category 3 has five subcategories based on the category of best
mortar response of GCS. Many participants have commented
about the usefulness of it. The ECS could be understood for
beginners in evaluating consciousness level and useful for
staff education.[6,7]

**Module B: Stroke scale**
The National Institute of Health (NIH) stroke scale is a
standardized method used by physicians and other health
care professionals to measure the level of impairment caused
by a stroke.[10,11] The NIH stroke scale could measure several
aspects of neurological function, including 1) consciousness,
2) gaze, 3) vision, 4) facial palsy, 5) arm movement, 6) leg
movement, 7) ataxia, 8) sensation, 9) language, 10) dysarthria
and 11) extinction [Table 3]. A maximal score of 42 represents
the most severe stroke. Participants learned how to evaluate
neurological conditions using NIH stroke scale with simulated
patients [Figure 1]. Interestingly, although some participants
were not familiar with NIH stroke scale until workshop, they
have commented about the usefulness of it. The NIH stroke
scale could be understandable for medical staff in evaluating
neurological conditions and also useful for staff education in
the same as coma scale.

**Module C: Cerebral herniation**
This module introduced initial management for impaired
respiratory and circulatory function in patients by slides.
Participants could learn to stabilize airway obstruction,
breathing disturbance and extensive hypertension and
to evaluate cerebral herniation. Emergency medical
staffs should assess the patient with suspected stroke
within 10 minutes of arrival in the hospital. General care
includes assessment and support of airway, breathing, and
circulation. The American Heart Association Guidelines
indicate that emergency medical staff should administer oxygen to hypoxemic patients, confirm intravenous access
and obtain blood samples.[12] We design algorithm of PNLS
for neurosurgical emergency patients [Figure 2]. It is
emphasized that stabilization of respiratory and circulatory
function has priority over evaluation of cerebral herniation.

### Table 2: The Emergency Coma Scale (Ohta)

| Category 1 | Category 2 | Category 3 |
|------------|------------|------------|
| The patients open their eyes, speak and/or behave spontaneously (awake) and | The patients can open their eyes, speak and/or behave (awaked) by | The patients can neither open their eyes, nor speak by painful stimuli (not aroused) but respond with |
| 1 can say correct date, place and person | 10 speech | 100 localization |
| 2 cannot say correct date, place and person | | 100W withdraw forearm with opened armpits |

Table 2: The Emergency Coma Scale (Ohta)

| LOC: Level of consciousness |
|-----------------------------|
| 0 = Alert, 1 = Not alert but arouse, 2 = Not alert, 3 = unresponsive |
| 0 = Answers both, 1 = Answers one, 2 = Answers neither question |
| 0 = Perform both, 1 = Perform one, 2 = Perform neither task |
| 0 = Normal, 1 = Partial gaze palsy, 2 = Forced deviation |
| 0 = No visual loss, 1 = Partial, 2 = Complete, 3 = Bilateral hemianopsia |
| 0 = Normal, 1 = Minor, 2 = Partial, 3 = Complete paralysis |
| 0 = No drift, 1 = Drift before 10 seconds, 2 = Fall before 10 seconds, 3 = No effort against gravity, 4 = No movement |
| 0 = No drift, 1 = Drift before 10 seconds, 2 = Fall before 10 seconds, 3 = No effort against gravity, 4 = No movement |
| 0 = No drift, 1 = Drift before 5 seconds, 2 = Fall before 5 seconds, 3 = No effort against gravity, 4 = No movement |
| 0 = Absent, 1 = Present in one limb, 2 = Present in two limb |
| 0 = Normal, 1 = Mild-to-moderate loss, 2 = Severe to total loss |
| 0 = Normal, 1 = Mild-to-moderate aphasia, 2 = Severe aphasia, 3 = Mute, global aphasia |
| 0 = Normal, 1 = Mild-to-moderate dysarthria, 2 = Severe dysarthria |

L: Localization, W: Withdrawal, F: Flexion, E: Extension

Table 1: Four modules of the international PNLS course

| Module | Goal |
|--------|------|
| A: Coma scale | Evaluation of consciousness level using several coma scale (GCS and ECS) |
| B: Stroke scale | Evaluation of neurological conditions using NIH stroke scale |
| C: Cerebral herniation | Early detection and management of cerebral herniation |

Table 3: National Institute of Health stroke scale

| 1 LOC | 1b LOC questions | 1c LOC commands | 2 Best gaze | 3 Visual fields | 4 Facial weakness | 5a Motor arm | 5b Motor arm | 6a Motor leg | 6b Motor leg | 7 Ataxia | 8 Sensory | 9 Best language | 10 Dysarthria | 11 Extinction |
|-------|-----------------|-----------------|-------------|----------------|-----------------|-------------|-------------|-------------|-------------|----------|----------|----------------|--------------|------------|
| o = Alert, 1 = Not alert but arouse, 2 = Not alert, 3 = unresponsive | o = Answers both, 1 = Answers one, 2 = Answers neither question | o = Perform both, 1 = Perform one, 2 = Perform neither task | o = Normal, 1 = Partial gaze palsy, 2 = Forced deviation | o = No visual loss, 1 = Partial, 2 = Complete, 3 = Bilateral hemianopsia | o = Normal, 1 = Minor, 2 = Partial, 3 = Complete paralysis | o = No drift, 1 = Drift before 10 seconds, 2 = Fall before 10 seconds, 3 = No effort against gravity, 4 = No movement | o = No drift, 1 = Drift before 10 seconds, 2 = Fall before 10 seconds, 3 = No effort against gravity, 4 = No movement | o = No drift, 1 = Drift before 5 seconds, 2 = Fall before 5 seconds, 3 = No effort against gravity, 4 = No movement | o = No drift, 1 = Drift before 5 seconds, 2 = Fall before 5 seconds, 3 = No effort against gravity, 4 = No movement | o = Absent, 1 = Present in one limb, 2 = Present in two limb | o = Normal, 1 = Mild-to-moderate loss, 2 = Severe to total loss | o = Normal, 1 = Mild-to-moderate aphasia, 2 = Severe aphasia, 3 = Mute, global aphasia | o = Normal, 1 = Mild-to-moderate dysarthria, 2 = Severe dysarthria | o = Normal, 1 = Mild, 2 = Severe |

LOC: Level of consciousness
Figure 1: The scenery of international Primary Neurosurgical Life Support course in 9th Asian Congress of Neurological Surgeon in Kuala Lumpur on November 22, 2010

Figure 2: PNLS algorithm for neurosurgical emergency patients. Reference in the American Heart Association guidelines. EMS: Emergency medical services, ABC: Airway, breathing, and circulation, IV: Intravenous, CT: Computed tomography

Key points in management include the assessment of oxygenation, blood pressure, consciousness level, and the papillary examination before computed tomography (CT) scan. Treatment strategies are directed toward maintaining adequate oxygenation and perfusion, and then treating cerebral herniation. All the workshop participants confirmed these points.

Module D: Case simulation
We designed and performed a group work, which was a system/structure oriented case debriefing to summarize PNLS course. The group work was performed using a clinical

Figure 3: Results of the questionnaires
Table 4: Time schedule of the international PNLS course in the 8th ACNS

| Time         | Session                          |
|--------------|----------------------------------|
| 15:30-15:50  | Keynote lecture                  |
| 15:55-16:30  | Module A: Coma scale             |
| 16:35-17:10  | Module B: Stroke scale           |
| 17:15-17:50  | Module C: Cerebral herniation    |
| 17:55-18:30  | Module D: Case simulation        |

PNLS: Primary Neurosurgical Life Support, ACNS: Asian Congress of Neurological Surgeon

Conclusions

We performed the new version of international PNLS course in 8th ACNS as hands-on education course. The participants’ comments indicated that a sufficiently high standard of knowledge was obtained in the present course. The international PNLS course could play an important role for Asian neurosurgical education.

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