NOTE

INTRODUCTION OF THE STANDARD PREHOSPITAL STROKE LIFE SUPPORT (PSLS) TRAINING OF EMS PARAMEDICS FOR THE PREHOSPITAL MANAGEMENT OF CEREBROVASCULAR DISEASE IN JAPAN

NOBUYUKI SUZUKI

Emergency & Critical Care Center, Toyohashi Municipal Hospital, Toyohashi, Japan

ABSTRACT

Although the introduction of t-PA (tissue plasminogen activator) was considered radical treatment for acute cerebral ischemic disease, the actual number of cases for such administration was limited in Japan for many reasons; one such reason was related to the ability of EMT (emergency medical technician) paramedics to transport patients to the proper hospital for treatment within 2 hours of onset. From this point of view, the Committee of the Prehospital Stroke Life Support (PSLS) of the Japanese Society for Emergency Medicine (JSEM) developed an original standard for prehospital treatment of stroke. In this paper, the author provides an overview of PSLS and the half-day practical course, which has been widely disseminated over a short period of time.

Key Words: Tissue plasminogen activator (t-PA), Prehospital Stroke Life Support (PSLS), Kurashiki Prehospital Stroke Scale (KPSS)

INTRODUCTION

In Japan, stroke is the second leading reason for emergency hospitalization and the third leading cause of death.[1] Stroke treatment accounts for 10% of all medical expenditures[2] and for 30% of all patients in Japan receiving medical care.[3] In 2005, the Japanese Ministry of Health, Labour and Welfare decided that the intravenous administration of t-PA (tissue plasminogen activator) for stroke patients would be covered by Japanese National Health Insurance.[4] It set out to establish a new system whereby t-PA was available 24 hours a day in hospitals designated as stroke centers in which a neurologist or neurosurgeon was also available. However, the actual number of cases successfully administered[5] was still limited. This paper aims to disseminate the relevant information not only to EMT (emergency medical technician) paramedics but also to medical personnel working in emergency departments. It further aims to report the results of a recently held PSLS (Prehospital Stroke Life Support) course.

————————————

Corresponding author: Nobuyuki Suzuki

Emergency & Critical Care Center, Toyohashi Municipal Hospital,

50 Aotake, Toyohashi 441-8570, Japan

Phone: +81-532-33-6111, Fax: +81-532-33-6177, E-mail: duke@poem.ocn.ne.jp

Nobuyuki Suzuki

CURRENT SITUATION AND PROBLEMS

EMT paramedics in Japan currently perform basic life support and advanced cardiac life support (BLS/ACLS)[6] for cardiopulmonary arrest patients as well as performing prehospital trauma evaluation and care (JPTEC)[7] for trauma patients. In the case of possible stroke patients, EMT paramedics should be required to assess potential t-PA indicated patients at the scene for transfer to a stroke center to avoid delay in treatment upon arrival at the hospital, thus improving the clinical outcome of recovery.[7-10] However, due to the limited capacity of most stroke centers in Japan, triage has become necessary to avoid overcrowding in the stroke centers. EMT paramedics must also decide the best transfer method to the hospital by ambulance or helicopter, because of the limited time available to treat stroke victims. Until 2007, there was no prehospital standard such as advanced medical life support (AMLS) for the treatment of cerebrovascular disease. The Japanese Society for Emergency Medicine (JSEM) is currently planning to establish a revised medical standard or other AMLS in the near future.

RESPONSE TO PROBLEMS

To address these problems, a committee was established by the JSEM to create a prehospital standard called PSLS for the treatment of cerebrovascular disease, one result of which was the creation of the PSLS Course Guide[11] which was disseminated by the JSEM in 2007 to educate EMT paramedics in the management and care of stroke patients.

OVERVIEW AND ROLE OF PSLS

Acute stroke therapy is time-dependent since the intravenous administration of t-PA can improve the clinical outcome of patient recovery only if given within three hours of stroke onset. The concept of the PSLS is first to recognize and assess a stroke using the Cincinnati Prehospital Stroke Scale (CPSS),[12] and to then assess its severity with the KPSS[13] (see below for further details). After a systematic assessment following the PSLS protocol, EMT paramedics

PSLS: (Prehospital Stroke Life Support)

ISLS: (Immediate Stroke Life Support)

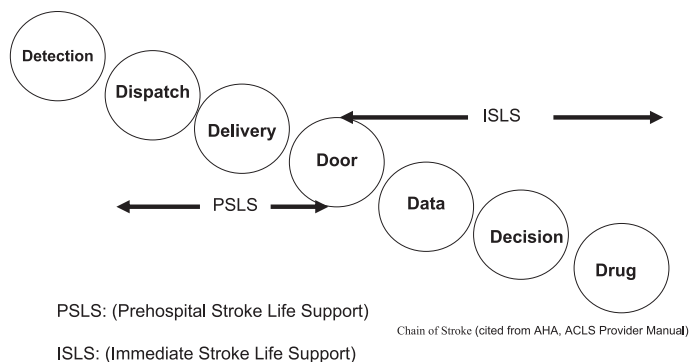Chain of Stroke (cited from AHA, ACLS Provider Manual)

Fig. 1 Role of PSLS and ISLS.
PSLS is the standard ranging from the second ring to the fourth in the Chain of Stroke (7D's), whereas the remaining rings are covered by ISLS (Immediate Stroke Life Support), which is the stroke at the hospital.

decide the optimal transportation method to a stroke center, since shortening the time to transfer the stroke patient correlates to the first 4 Ds of the "7 Ds of Detection"[14] (Fig. 1).

BASIC ALGORITHM OF PSLS

Using PSLS, the orderly and systematic management of stroke patients in prehospital situations can be conducted more smoothly and efficiently. First, the patient's vital functions must be quickly and efficiently assessed using the ABC algorithm. During the primary survey, if a life-threatening condition is determined, then a high-priority transfer of the patient to a hospital (load & go) is carried out without a disability assessment. If the ABCs are under control, disability as a neurological status is assessed using the GCS score and the CPSS. After taking a SAMPLE (Symptoms, Allergy, Medication, Past medical history, Last oral intake and Event), the patient can be safely assessed as having suffered a stroke (Fig. 2).

The KPSS indicates the severity of the stroke, whereas the CPSS, the Melbourne Ambulance Stroke Screen[15] and the Los Angeles Prehospital Stroke Screen (LAPSS)[16] which can not be used since Japanese EMT paramedics are not allowed to check blood glucose are used only to identify a stroke. The KPSS was constructed using 4 items, i.e., consciousness level, consciousness disturbance, motor weakness, and difficulty with language. These 4 items were chosen and modified based on the 15 neurological examination test items of the National Institutes of Health Stroke Scale (NIHSS). A KPSS score between 3 and 9 correlates with an NIHSS score between 5 and 22, indicating that the stroke patient can be considered a candidate for t-PA therapy.[13] Based on a preliminary study for the use of KPSS for EMT paramedics, it takes approximately 2 minutes to complete an assessment of the 4 KPSS items. Paramedics using the KPSS to inform the receiving stroke center in advance of the possible severity of a stroke shortens the assessment and treatment time from door arrival at the hospital to CT from 48 minutes (± 47) to 29 minutes (± 21) (p = 0.005).[13]
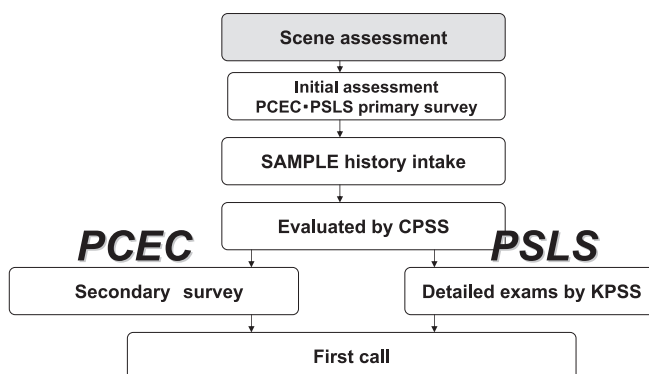
Algorithm of PCEC・PSLS

Fig. 2 Algorithm of PCEC · PSLS
This algorithm is simplified and based on the Primary and Secondary Surveys which are well known as the Universal standard. The flow goes to the KPSS in the case of a positive CPSS to evaluate the severity of the stroke. In the case of a negative CPSS, the flow goes to PCEC to identify physical/anatomical abnormalities which might reveal consciousness disturbances.
PCEC: Prehospital Coma Evaluation and Care

Table 1 Kurashiki Prehospital Stroke Scale
Kurashiki Prehospital Stroke Scale (KPSS) is the simplified version of the National Institute of Health Stroke Scale (NIHSS) to correlate the results of NIHSS scale.

				Points
Consciousness level	Level of consciousness			
	Alert			0
	Arousable by stimulation			1
	No response			2
Consciousness disturbance	Ask patient's name			
	Correct			0
	Incorrect			1
Motor weakness (kinetic paralysis)	Ask patient to close eyes, raise arms to the front with palms down (with gestures)	Rt hand	Lt hand	
	Able to keep arms raised parallel	0	0	
	Able to raise arms but not in position so they go downward	1	1	
	Unable to raise arms	2	2	
	Instruct patient to close eyes, raise legs from the bed (with gestures)	Rt leg	Lt leg	
	Able to keep legs raised in parallel	0	0	
	Able to raise legs but not in position so they go downward	1	1	
	Unable to raise legs	2	2	
Language	Ask patient to say 'It's fine today' repeatedly.			
	Being able to clearly say it repeatedly			0
	Either unclear (slurred) or abnormal			1
	Silent, unable to understand what is said			2
Total				/13 points

The exercise- and case-based training is well organized as the off-the job training for EMT paramedics.

PSLS COURSE OVERVIEW

Since one team of Japanese EMT paramedics is comprised of 3 people, all case-based training is performed with one paramedic team, with each person alternatively playing the role of leader, simulated patient and presenter. The PSLS course provides the participants with an immediate evaluation of a stroke and the basic knowledge required to assess the patient's level of unconsciousness using the GCS or other scales, to identify whether a patient has suffered a stroke or not, to assess the severity of a stroke as soon as possible, and to transfer the patient to a hospital with optimal care having been provided. PSLS Course contents are shown in Table 2.

The first PSLS course was held using the published guidebook on January 19th, 2007 at the 12th annual meeting of the Japan Society of Neurosurgical Emergency in Tokyo. Since then, 224 PSLS courses have been conducted throughout Japan with over 5901 participants as of 31st July, 2009.

Table 2 Half-day PSLS course

Lecture: General overview of stroke (30 minutes)
- Exercise: Using GCS coma scale (30 minutes)
- Exercise: Using CPSS and KPSS stroke scales (30 minutes)
- Case-based training: 2 scenarios (120 minutes)
    Scenario 1: Stroke, t-PA indicated
    Scenario 2: Stroke, not t-PA indicated
- Questions and Discussion (30 minutes)

Table 3 Results of PSLS course (As of July 31, 2009)

No. of PSLS courses	No. of course sites (prefecture)	No. of attendees
224	24	5,901

The Committee of the Prehospital Stroke Life Support enabled the dissemination and education of the standard of the revised prehospital stroke management through the PSLS Course to spread quickly over a short period of time.

CONCLUSION

A standard was introduced for the stroke management of PSLS developed by the PSLS committee of the JSEM and for the training of EMT paramedics in the use of PSLS. Using PSLS, the orderly and systematic management of stroke patients in prehospital situations can be conducted more smoothly, correlating with the first four Ds of the 7 Ds of Detection. The KPSS has proved useful and convenient in estimating the indications for t-PA administration in prehospital situations with the overall effect of shortening the time of treatment after arrival at a stroke center, thus improving the chances for the clinical recovery of stroke patients.

The PSLS committee of the JSEM proposes to establish a systematic management of strokes from the Detection to Drug, (7Ds) with the cooperation and coordination among all medical personnel. Therefore, the PSLS Course and Course Guide Book could be a valuable reference.

REFERENCES

1) Health and Welfare Statistics Association. *Kosei no Shihyo (Journal of Health and Welfare Statistics)*, 2007; 54: p. 51. (in Japanese).
2) Health and Welfare Statistics Association (editor). Kokumin Iryohi 2006 (National Medical Care Expenditure 2006). pp. 90–91, 2006, Health and Welfare Statistics Association, Tokyo. (in Japanese).
3) Health and Welfare Statistics Association (editor). Kokumin Seikatsu Kiso Chosa (Comprehensive Survey of Living Conditions of the People on Health and Welfare). pp. 328–329, 2009, Health and Welfare Statistics Association, Tokyo. (in Japanese).
4) Official Announcement on the Approval of New Drugs from the Evaluation Licensing Division, Pharmaceutical and Food Safety Bureau, Ministry of Health, Labour and Welfare. 11th , Oct. 2005. (in Japanese) .
5) Minematsu K. Proceedings of the second Ischemic Stroke t-PA Conference panel discussion. *Nosochu (Japanese Journal of Stroke),* 2008; 30: 789–790. (in Japanese).
6) Ishimi T, Kobayashi S, Sugiura T, Okudera T, Tange D, Hayakawa H, Yamahata Y. Nihon Kyukyu Igakukai ICLS Couse Guidebook (ICLS: Immediate Cardiac Life Support Course Guidebook). pp. 12–25, 2007, Yodosha, Tokyo. (in Japanese).
7) Production of Manual Working Group (editor). JPTEC Provider Manual. pp. 5–9, 2003, Planet, Tokyo. (in Japanese).
8) Rajajee V, Saver J. Prehospital care of the acute stroke patient. *Tech Vasc Interv Radiol,* 2005; 8: 74–80.
9) Brice JH, Griswell JK, Delbridge TR, Key CB. Stroke: from recognition by the public to management by emergency medical services. *Prehosp Emerg Care,* 2002; 6: 99–106.
10) Kennedy J, Ma C, Buchan AM. Organization of regional and local stroke resources: methods to expedite acute management of stroke. *Curr Neurol Neurosci Rep,* 2004; 4: 13–8.
11) Committee of the Prehospital Stroke Life Support (editor). PSLS Course Guidebook: Prehospital Stroke Life Support. 2007, Herusu Shuppan, Tokyo. (in Japanese).
12) Kothari R, Hall K, Brott T, Broderick J. Early stroke recognition: developing an out-of-hospital NIH Stroke Scale. *Acad Emerg Med,* 1997; 4: 986–90.

Nobuyuki Suzuki

13) Kimura K, Inoue T, Iguchi Y, Shibazaki, K. Kurashiki Prehospital Stroke Scale. *Cerebrovasc Dis,* 2007; 25: 189–191.
14) ACLS Provider Manual. 2001, American Heart Association, Dallas.
15) Bray JE, Martin J, Cooper G, Barger B, Bernard S, Bladin C. Paramedic identification of stroke: community validation of the Melbourne ambulance stroke screen. *Cerebrovasc Dis,* 2005; 20: 28–33.
16) Kidwell CS, Saver JL, Schubert GB, Eckstein M, Starkman S. Design and retrospective analysis of the Los Angeles Prehospital Stroke Screen (LAPSS). *Prehosp Emerg Care,* 1988; 2: 267–273.