SPECIAL CONTRIBUTION

Clinical electromyography and electrodiagnosis course at Keio University Hospital – a 7-year experience

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Abstract. Although electromyography and electrodiagnosis (EMG-EDX) is one of the most fundamental skills in rehabilitation medicine, the number of residency programs that can provide comprehensive postgraduate EMG-EDX training is still limited in Japan. Under these circumstances, we started a 2-day primer course in EMG-EDX at Keio University Hospital in 1998. To review our 7-year experience with the course, we analyzed the number and specialty of the participants, their appraisal of the lectures and practical sessions, and the score distribution of the final examination. The number of participants totaled 288 during the past 7 years, and the mean number for each year was 41. The distribution by specialty for the whole period was 64.0% for rehabilitation medicine, 25.4% for orthopedic surgery, 5.1% for neurology, 1.0% for pediatrics, 0.5% for gerontology and 4.1% for physical therapists and occupational therapists. The difficulty levels of the lectures were judged as appropriate by 81 to 95.5% of the participants, and the presentation was judged as good by 34 to 67% of them. For the practice sessions, the difficulty levels were judged as appropriate by 88% of the participants, and the quality of the supervisors was judged as good by 64% of them. The mean score for the final examination was 56.0 (SD 15.2, median 60). In conclusion, our course has played an important role to promote EMG-EDX in our country by providing compact introductory exposure to EMG-EDX for beginners. A follow-up system for the course graduates is planned to support their EMG-EDX practice. (Keio J Med 54 (4): 193-196, December 2005)

Key words: neuromuscular disease, post graduate training, electrophysiology, rehabilitation medicine

Introduction

In the practice of physical medicine and rehabilitation (PMR), which specializes in the diagnosis, evaluation and treatment of "dysmobility" or a disturbance of movement,¹ electromyography and electrodiagnosis (EMG-EDX) is one of the most fundamental skills that must be mastered by everyone pursuing this specialty.² This holds true for neurologists and to a certain extent to orthopedic surgeons who are responsible for the management of persons with neuromuscular disorders. Thus training in EMG-EDX should constitute a significant proportion of the postgraduate training in PMR, which is the case in several countries in the world. In the United States, for example, most of the trainees in PMR take board certification examination in electrodiagnostic medicine just after finishing PMR board certification. The eligibility requirements for this examination are: 1) specialty certification in American Board of Psychiatry and Neurology, American Board of Physical Medicine and Rehabilitation, American Osteopathic Board of Neurology and Psychiatry, American Osteopathic Board of Physical Medicine and Rehabilitation, or Canadian equivalent; 2) training in electrodiagnostic medicine that must include at least 6 months fulltime preceptorship and 200 complete electrodiagnostic evaluations; 3) At least one year of independent experience following training and 200 ad-

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	Day 1	Day 2
AM	Orientation (10 min) What is electrodiagnostic study? (45 min) Basics of neuromuscular system (60 min)	Surface EMG (20 min) Needle EMG (70 min) Practical session 2: Needle EMG (75 min)
PM	Nerve conduction studies and late responses (60 min) Wave form analysis (90 min) Questions & answers (30 min) Practical session 1: Nerve conduction studies and late responses (90 min)	How to organize EMG studies (60 min) Questions & answers (30 min) Final examination (30 min) Certificate hand-out

Table 1 The Electromyography and Electrodiagnosis Course for Beginners at Keio University Hospital

ditional complete electrodiagnostic evaluations.³ In Korea, which has one of the most advanced PMR postgraduate training systems in Asia, the requirements for PMR board certification consist of a four-year resident training period that must include 200 cases of EMG studies in addition to the experiences of more than 300 patients, 12 out-hospital seminar attendances, 200 in-hospital seminar attendances, publication of more than 3 scientific articles and training at related departments.⁴

In contrast, although EMG-EDX is listed in the postgraduate training curriculum released by the Japanese Association of Rehabilitation Medicine (JARM),⁵ no specific criteria are given to document adequate training in EMG-EDX, and it is not included in the eligibility requirements for specialty board examination. The number of residency programs that can provide comprehensive postgraduate EMG-EDX training is still limited, and there are many residents who get board certified without having sufficient training and experience in EMG-EDX. More or less, this situation applies to neurology and orthopedic surgery as well, and the improvement and enrichment of a training system in EMG-EDX should therefore be given a very high priority in our country.

Under these circumstances, the Department of Rehabilitation Medicine at Keio University School of Medicine started an annual primer course in EMG-EDX in 1998. The purpose of this paper is to review our 7-year experience with the course to point to future directions.

Course Description

The course is aimed at beginners, and the 2-day program consists of 8 lectures, 2 question-and-answer sessions, 2 practical sessions and a final examination (Table 1). The instructors and supervisors are department staffers with sufficient EMG-EDX experience and one or two invited experts in the field. The practical sessions consist of 2 parts: nerve conduction studies and needle EMG. The participants are divided into 7 to 8 groups, each consisting of one supervisor with more than 10-year experience in EMG-EDX, one resident that acts as an assistant and 6 to 7 participants. Basic techniques are demonstrated and practiced by all participants in turn, and some advanced techniques are also covered at the request of the participants. At the end of the course, the participants take a-30 min test consisting of 20 multiple-choice questions (12 related to basic knowledge of EMD-EDX and 8 to case studies), and a brief test review is provided.

Method of Analysis

From the list of course participants for the past 7 years (1998 to 2004) and the questionnaire survey performed at the end of each course, we analyzed the number and specialty of the participants, their evaluation of the lectures and practical sessions provided, and the score distribution of the final examination.

Results

The number of participants totaled 288 during the past 7 years, and the mean number for each year was 41 (range 32 to 54). The distribution by specialty for the whole period was 64.0% for PMR, 25.4% for orthopedic surgery, 5.1% for neurology, 1.0% for pediatrics, 0.5% for gerontology and 4.1% for physical therapists and occupational therapists.

For the lectures, the difficulty levels were judged as appropriate by 81.0 to 95.5% of the participants, and the presentation was judged as good in 34.1 to 67.4% and as average in 32.6 to 61.4% of them (Table 2). For the practice sessions, the difficulty levels were judged as appropriate by 88.6% of the participants, and the quality of the supervisors was judged as good in 63.6% of them (Table 2). The mean score for the final examination was 56.0 (SD 15.2, range 10 to 90, median 60).

Discussion

In the United States, many EMG-EDX courses are held each year, such as Comprehensive Clinical Neuro-

	Difficulty level			Quality		
	Too difficult (%)	Appropriate (%)	Too easy (%)	Good (%)	Average (%)	Poor (%)
Lectures						
Introduction	0	95.5	4.5	34.1	61.4	4.5
Basics	19.0	81.0	0	28.6	59.5	11.9
Nerve conduction studies	14.0	81.4	0	51.9	43.9	4.9
Surface EMG	6.8	93.2	0	38.6	61.4	0
Needle EMG	6.8	93.2	0	67.4	32.6	0
How to organize EMG studies	5.1	94.9	0	43.5	55.0	2.5
Practical sessions						
Nerve conduction studies	2.3	88.6	9.1	34.1	63.6	2.3
Needle EMG	2.3	88.6	9.1	34.1	63.6	2.3

Table 2 Appraisal of the Lectures and Practical Sessions by the Course Participants (N = 288)

physiology Course (Cleveland Clinic Foundation), Update in Clinical Neurophysiology (Mayo Clinic), Super EMG/Practical Electromyography (Ohio State University Medical Center), Annual Electrodiagnosis and Clinical Neurophysiology: A High Intensity Review (Rehabilitation Institute of Chicago), Clinical Electromyography Review Course (University of Iowa), or Electrodiagnosis of Focal and Diffuse Neuropathies (University of Pittsburgh School of Medicine).⁶ These courses are participated by residents preparing for board examination and practicing electromyographers for continuing medical education. In Japan, although there have been lecture courses for technicians and hands-on seminars during the annual meeting of the Japanese Association of Clinical Neurophysiology, the course at Keio is the first systematic one that attempted to provide introductory lectures and practical sessions in EMG-EDX targeted mainly toward physicians who are novice to the field.

Since the course was started in 1998, 288 participants, mostly physicians, have finished the course. Their top 3 specialty backgrounds were PMR, orthopedics and neurology, and this reflects the need for EMG-EDX for these disciplines. Because of the limited number of supervisors and EMG equipment, we have to limit the number of participants to less than 50, and 10 to 20 applicants are rejected each year. This indicates that there is potentially a great need for a course like this among practicing physicians involved in neuromuscular care.

In 2000, our course became accredited as one of the postgraduate educational courses in PMR by the JARM, and it is becoming a very popular one among residents in PMR preparing for the board examination. Prompted by our success, the Japanese Association of Clinical Neurophysiology also started a 2-day course in 2004. Together with the course at Keio, the new course is hoped to contribute to popularize and improve EMG-EDX skills in Japan.

However, the intensity and thoroughness of the courses in Japan are far less when compared with those in the U.S. As an example, the course curriculum at the Rehabilitation Institute of Chicago is demonstrated in Table 3.⁷ It is a 4-day course held from early morning to evening each day, and covers a wide range of EMG-EDX. The level of participants is also high, having a fair amount of EMG-EDX experience in their clinical practice. In the future, there will be a need for advanced courses like this in Japan as well. There is also a movement toward a board certification system for EMG-EDX in our country as well, and the need for courses like ours will be greater.

So far, we believe that our course, as the first systematic one of this kind in Japan, has made an important contribution to promote EMG-EDX in our country by providing compact introductory exposure to EMG-EDX for beginners. The generally favorable appraisal of the course by the participants and the level of knowledge gained as measured with the final examination indicate its potential usefulness, but do not convincingly prove it. The usefulness or effectiveness of a training course like ours should be evaluated by analyzing the ability of the participants to organize, perform and interpret EMG studies appropriately and efficiently. We therefore consider it necessary to develop a followup and support system for the course graduates that can evaluate their competency as clinical electromyographers and at the same time assist them to set up EMG laboratory, judge EMG results, update knowledge and skills in EMG-EDX. Our future action plans to achieve these goals are as follows: 1) Register as many skilled electromyographers as possible who can

	Day 1	Day 2	Day 3	Day 4
AM	Instrumentation	Less common nerve conduction studies	Peripheral neuropathy	Single fiber EMG
	Anatomy and physiology of peripheral nerve and muscle	Myopathy	Evaluation of the pelvic floor	Group demonstration: single fiber EMG/repetitive stimulation
	Fundamentals of nerve conduction studies	Somatosensory evoked potentials (SSEP)	Motor neuron disease	Wave form practicum (1)
	Focal mononeuropathies	Group demonstration: SSEP	Pitfalls of nerve conduction studies	Wave form practicum (2)
РМ	Radiculopathy	Quantitative EMG	Waveform evaluation	Test review
	Peripheral nerve response to injury	Assessment of autonomic function	The neuromuscular junction	
	Electrodiagnostic evaluation of plexopathies and polyradiculopathies	Group demonstration: autonomic & quantitative testing	Late responses (blink, H, F, and A waves)	
	Needle electrode examination	Focal mononeuropathies of the upper extremities	Interactive case presentation/discussion	
	Group demonstration: needle EMG			

Table 3 Electrodiagnosis and Clinical Neurophysiology: A High Intensity Review. 26th Annual Course, Rehabilitation Institute of Chicago,2003

provide support and advices; 2) Using an on-line system, the advisors provide assistance and advices to the course graduates real time while they are performing EMG studies in their own laboratories; 3) By recording the manner of organizing the EMG-EDX studies and interpreting the results, the supervisors monitor progress, weakness and problems of their skills, and give them appropriate feedbacks; 4) After a certain period, the graduates are examined for their knowledge and skills, and when they are judged as competent enough, they are in turn registered as supervisors; 5) The problems encountered while practicing EMG-EDX are accumulated through this monitoring process, and analyzed and fed-back to improve the course. In this way, we believe that we can contribute to a sound development and popularization of clinical EMG-EDX practice in Japan.

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