EMG biofeedback training improves motor impairment of mental disease: A case study of Conversion disorder

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***Abstract*— EMG-based biofeedback training was administered to the patient with conversion disorder for improving motor impairment of the upper limb without any physical damage. Three months training brought dramatically improvement to muscle activity of her affected forearm. This study shows the efficacy of EMG-based biofeedback training for motor impairment caused by psychological problem.**

I. Introduction

"Conversion disorder" is a mental disease that refers to the presence of motor and/or sensory symptoms without adequate underlying medical explanation. In most cases, the treatment for this disease targets at the psychological problem causing the physical symptoms, but many of them reject the psychotherapy because of their denying the disease. Here, we administered EMG biofeedback training to prevent further decline of motor impairment of her paretic limb by disuse of it without the intervention to psychological problems, which was strongly rejected by the patient.

II. The Case

The patient was a 29 y/o female worked as a nurse in a university hospital and frequent vomiting and nausea appeared as her first sign of this disease at the "x" year. She quitted her job due to frequent vomiting at the X+1. At x+3 years, paresis of left upper and lower limbs was suddenly appeared. At x+4, she has got a tube inserted into her stomach because of her low nutrition caused by her vomiting. After hemiparesis occurred, she was in bed at home all day long for about 2 years and rejected any treatment including psychiatric approach for her disease. At x+7, she hospitalized department of psychosomatic medicine in our hospital and moved to our department for rehabilitation. At our first contact to her, left upper limb was complete loss of contraction, weakness of both legs, knee joint contracture, weakness in trunk muscles. No sensory disturbance and normal deep tendon reflex were found.

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III. Method

EMG bio-feedback training used an EMG training system for phantom limb pain, developed by one of the authors (M.O.C), and employs myoelectric pattern recognition and augmented reality [1,2]".

In calibration, this system learns the relationship between the EMG pattern and hand movement by requiring the patient to imitate hand movement in a monitor, recording the activities of extensor and flexor muscles of the affected forearm. Then, the patient was asked to move the hand avatar superimposed on her real-time image by trying to move her paretic limb (fig. 1). Training took about 1hour in a day, 5 days in a week for 3 months. Usage of her affected limb was measured with an activity meter attached to her both wrist for all day.

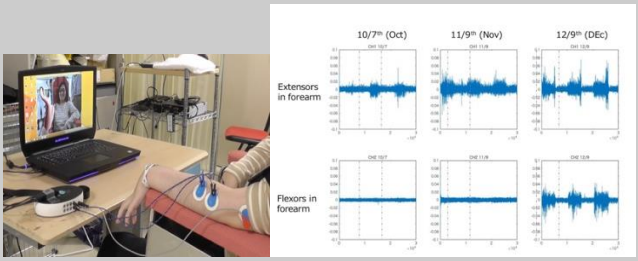

Figure 1. Experimental setting (left) and muscle activity change (right).

IV. Result and Conclusion

EMG biofeedback training improved motor impairment of left-side upper limb, resulting in clear EMG activates in both extensor and flexor muscles in accordance to movement effort (see fig. 1). According to the increase of EMG activities, usage of the affected upper limb in daily life were also increased. EMG biofeedback training is effective for motor symptoms of conversion disorder, although no intervention for psychological problem was administered.

References

[1] Ortiz-Catalan et al., "Phantom motor execution facilitated by machine learning and augmented reality as treatment for phantom limb pain: a single group, clinical trial in patients with chronic intractable phantom limb pain", the Lancet, Vo. 388, No. 10062, 10 Dec. 2016, pp. 2885–2894.

[2] Ortiz-Catalan et al., BioPatRec: A modular research platform for the control of artificial limbs based on pattern recognition algorithms, Code Source for Medicine and Biology, 2013, 8:11