

Frontal hypoactivation during a word fluency task in patients with panic disorder: A multichannel near-infrared spectroscopy study

Y. Nishimura^{a,*}, Y. Okazaki^a, H. Tanii^a, K. Inoue^a,
N. Kajiki^a, J. Tawara^a, A. Nishida^a, H. Kaiya^b

^a Department of Psychiatry, Mie University Graduate School of Medicine, 2-174 Edobashi, Tsu, Mie Japan
^b Research Center for Panic Disorder, Nagoya Mental Clinic, Nagoya, Japan

Abstract. In recent years, the functional neuroanatomy of anxiety disorder has received remarkable attention. The present study investigated regional cerebral blood volume changes in the frontal area during a word fluency task performed by patients with panic disorder, as observed by multichannel near-infrared spectroscopy. After having given a written informed consent, 121 patients with panic disorder and 44 healthy volunteers participated in the study. The results showed a significantly lower increase in oxyhemoglobin during the word fluency task among patients than among healthy controls, and the oxyhemoglobin increase was also significantly less among those patients who had suffered panic attacks during the last month, as compared with those without panic attacks during that period of time. The results confirmed the presence of functional hypofrontality in patients with panic disorder, and multichannel NIRS is considered as a useful tool for the clarification of the pathology of panic disorder. © 2006 Elsevier B.V. All rights reserved.

Keywords: Near-infrared spectroscopy (NIRS); Panic disorder; Panic attack; Frontal lobe

1. Introduction

In recent years, the functional neuroanatomy of anxiety disorder has received remarkable attention, in particular since the report of Reiman and colleagues in 1984 [1]. According to the following reports, the findings upon functional brain imaging

* Corresponding author. Tel.: +81 59 231 5018; fax: +81 59 231 5208.

E-mail address: ynishimu@clin.medic.mie-u.ac.jp (Y. Nishimura).

of patients with panic disorder suggested dysfunction in a number of regions of the brain, including the hippocampus, amygdala, temporal lobe, and frontal lobe [2–4]. Functional brain imaging studies have indicated that specific brain regions are commonly involved in the pathophysiology of panic disorder. However, the results reported to date are somewhat limited with respect to how they are to be interpreted. First, the sample size of most studies has been too small to demonstrate significance. Secondly, some studies have included patients with comorbid depression. Thirdly, the age range of subjects has varied greatly among studies. Another hindrance perhaps particular to this field of research is that patients with panic disorder tend to feel uncomfortable in narrow and noisy places, which currently cannot be avoided with the use of PET, SPECT, and MRI technologies. In order to overcome the latter issue, we used near-infrared spectroscopy (NIRS) in the present study.

NIRS is an optical imaging technique that allows the non-invasive measurement of changes in the concentration of oxygenated ([oxy-Hb]) and deoxygenated ([deoxy-Hb]) hemoglobin [5]. There is only one early report of NIRS findings of panic disorder to date; the left frontal [oxy-Hb] value was significantly lower in patients than in control subjects when the subjects were confronted with emotionally relevant stimuli measured with two-channel NIRS [6]. Functional measurements with NIRS have been conducted to investigate regional cerebral blood volume changes in subjects performing various tasks. In particular, a word fluency task has been used to investigate healthy subjects and patients with different psychiatric disorders [7].

In the present study, a multichannel NIRS system was used in order to examine the regional cerebral blood volume changes during the performance of a word fluency task by patients with panic disorder.

2. Materials and methods

2.1. Subjects

In the present study, 121 patients with panic disorder and 44 healthy volunteers (mean age = 30.09 ± 10.46 years; 23 males, 21 females) participated after having given a written informed consent. Among these initial participants, 12 patients with left-handedness, substance use disorder, or alcoholism were excluded; thus, a total of 109 patients (mean age = 35.78 ± 9.46 years; 34 males, 75 females) were included in the analysis. All patients were outpatients of the Nagoya Mental Clinic in Japan. The patients had all received a diagnosis according to the DSM-IV criteria. All subjects were right-handed, as based on their Edinburgh scores (mean \pm S.D. = 90.15 ± 20.11). Most patients were taking moderate doses of psychotropic drugs.

To assess symptom characteristics and severity scores, the Japanese version of the Panic Disorder Severity Scale (PDSS-J) [8] and the Japanese version of the Zung Self-rating Depression Scale [9] were used. The Sheehan Disability Scale-Japanese version (SDISS) [10] was used for the evaluation of each patient's perceived quality of life.

This study was approved by the institutional ethical committee of Mie University School of Medicine and Warakukai Nagoya Mental Clinic.

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