NOTE

ANOMIC ALEXIA OF KANJI IN A PATIENT WITH ANOMIC APHASIA

**Rie Yamawaki[1], Kyoko Suzuki[1], Kazuyo Tanji[1], Toshikatsu Fujii[1], Keiko Endo[2], Kenichi Meguro[1]
and Atsushi Yamadori[1]**

([1]Division of Neuropsychology, Department of Disability Medicine, Tohoku University Graduate School of Medicine,
Tohoky, Japan; [2]Department of Rehabilitation, Tohoky University Hospital, Tohoky, Japan)

ABSTRACT

The ability to read aloud kanji (logogram) words and to comprehend their meaning was systematically examined to clarify the underlying mechanism of kanji alexia in a patient with anomic aphasia. Confrontation naming, reading aloud and reading comprehension tasks were performed using 110 words from 11 semantic categories written in kanji or kana. Performance in oral reading of kanji words was significantly worse than oral reading of the same words transcribed into kana words. In addition, for kanji words reading aloud was much worse than reading comprehension. Oral reading of kanji words had a significant correlation with naming pictures corresponding to the words, but no correlation with comprehension of kanji words. Qualitative analyses demonstrated that errors in oral reading and naming tasks had many features in common. Our results indicated that some common mechanisms underlie both naming and oral reading of kanji words. We propose calling this type of alexia "anomic alexia of kanji", which should be distinguished from kanji alexia with difficulty in both reading aloud and comprehension. Lesions in our patient were located in the middle part of the left middle temporal gyrus and its subcortical area, which could be important for access to the phonological lexicon from semantics.

Key words: kanji, alexia, anomic aphasia

INTRODUCTION

Alexia refers to an acquired disturbance in reading, both reading aloud and reading comprehension (Benson and Ardila, 1996). Japanese has two writing systems, kanji (logogram) and kana (syllabogram), which are used in combination. Dissociated reading ability between kanji and kana has sometimes been reported in alexia in Japanese (Yamadori, 1975, 1979; Iwata, 1984). More than twenty patients have been reported with alexia specific to or predominant for kanji, in which performance of reading aloud and reading comprehension was not examined separately. Some of these patients also had anomia together with kanji alexia. However, the relationship between anomia and alexia has not been fully examined.

We describe a patient with severe anomia with alexia specific for kanji, who could not read aloud kanji words but could comprehend their meanings. Systematic investigation was made to clarify the nature of his alexia and the neuronal basis of the impairment.

CASE REPORT

A 71-year-old, right-handed retired construction worker suffered from a head injury because of an accident while riding a bicycle. He was transferred to a local hospital where he was treated conservatively. A brain CT scan showed a cerebral haemorrhage in the left temporal lobe. He became alert in a week, but showed some difficulty with language. After two months, he was admitted to our hospital for further evaluation and rehabilitation. Neurological examination showed that functions of cranial nerves, motor and sensory functions were all preserved. Magnetic resonance images (MRI) of the brain demonstrated a haemorrhagic lesion in the middle temporal gyrus and its subcortical area extending to the temporal stem (Figure 1). Measurement of blood flow with ^{123}I-IMP single photon emission computed tomography (SPECT) demonstrated generalized hypoperfusion in the left cerebral hemisphere.

Neuropsychological examination revealed that he was oriented in time and place. His speech was fluent but with word finding difficulty and semantic paraphasia. Listening comprehension was fair and repetition was well preserved. Marked impairment was observed in naming objects through visual and tactile stimuli and by verbal description of objects (Table I). In contrast, he could describe the nature of these objects and show by gesture how to use them. Oral reading of kanji words was impaired while oral reading of kana characters was well preserved. Writing kanji characters was severely impaired, but writing kana characters was fairly preserved. No amnesia, apraxia, agnosia or visuoconstructional problems were observed.

EXPERIMENTAL INVESTIGATIONS

Reading and listening comprehension, reading aloud and naming was extensively examined using 110 common words in 11 semantic categories.
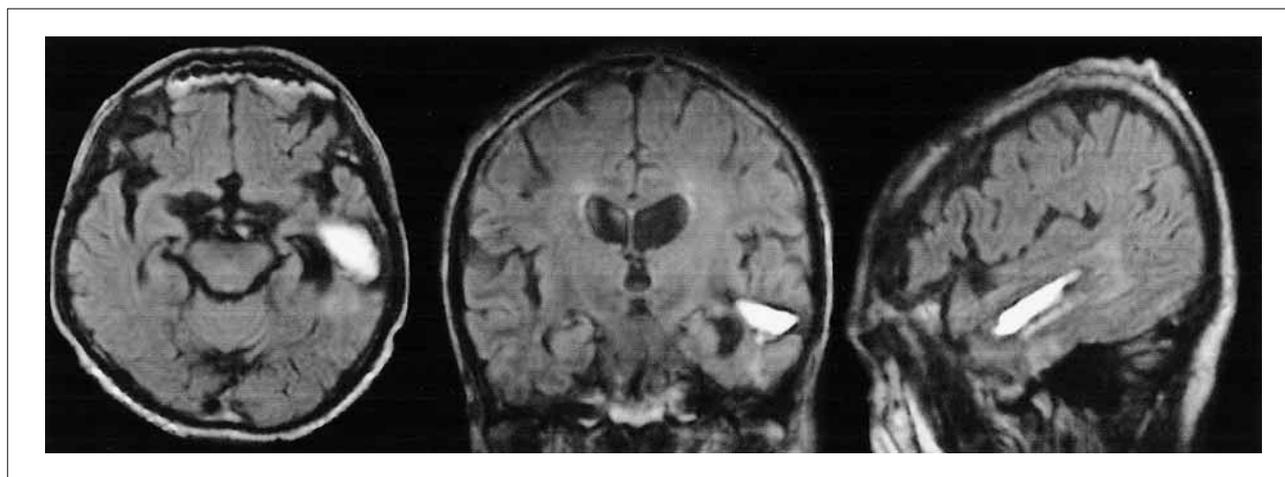
Fig. 1 – *Fluid-attenuated inversion recovery (FLAIR) MR images taken two months after injury (left: axial; middle: coronal; right: saggital section) demonstrated a hyperintensity area in the left middle temporal gyrus.*

TABLE I

Results of Neuropsychological Tests

Task	Correct
Language	
Reading aloud task of kanji characters* [240]	148 (62%)
Visual naming (real objects) [10]	0
Tactual naming [10]	1
Naming due to verbal description [20]	1
Auditory naming of environment sounds [10]	5
Standard language test of aphasia	
Oral reading of kanji words [5]	4
Kanji words recognition [10]	10
Oral reading of kana words [5]	5
Kana words recognition [10]	10
Intelligence	
WAIS-R (PIQ)	83
Raven Colored Progressive Matrices [36]	28
Memory	
Rey-Osterreich complex figure test	
(copy, immediate recall, 40-min recall) [36]	33, 11, 12
Benton visual retention test	4 correct, 10 errors
Frontal lobe function	
Trail making test A	1'51 (10-25%ile)
B	10'10 (under 10% ile)

[Full score]

*Relatively simple kanji characters were selected, which were learnt by the second grade of a primary school.

Black and white line pictures of 100 nameable objects belonging to the 10 semantic categories and 10 color cards were prepared. Word cards corresponding to the pictures and colors were also prepared, which were written with kanji or hiragana characters. Thus the total number of word-cards was 220. Words were selected from familiar concrete nouns from the NTT data base in Japanese (2000) so that word familiarity, character familiarity and orthographic plausibility for kanji words were high. In Japanese, a word can be written with either kanji or kana characters. But a word is usually written with kanji characters and another word is almost always written with kana characters. Orthographic plausibility refers to a subjective measure whether one type of characters is appropriate for a word. In the NTT data base for Japanese, orthographic plausibility was measured using a 5-point scale. For example, "Ongaku (music)" is almost always written with two kanji characters, so that the orthographic plausibility of Ongaku as a kanji word is 5. The mean value of word familiarity was 5.9 on a 7 point scale, the mean value of familiarity for kanji words 5.8 on a 7 point scale, orthographic plausibility 4.8 on a 5 point scale. Although consistency of the words was not available, orthographic plausibility has a good correlation with consistency. These parameters were not significantly different among category groups. Number of characters in kanji words was 1 to 3 with a mean of 1.5 characters and that in kana words was 1 to 8 with a mean of 3.05 characters.

The patient performed 8 tasks over a period of 40 days. Each session lasted an hour or less, the order of tasks was varied across the 11 categories. Correct answers within 20 s were counted in all the tasks except the description task that was performed without time pressure. (1) Naming. He was asked to name a picture or a color pointed to by an examiner. (2) Description. When he failed to produce a correct answer, he was asked to describe what it was. If his description was not detailed enough, questions about specific features of the item were given. His descriptions were rated by the third person who did not know the items since they were covered. They were considered correct when the rater could guess the name of the described items. The number of appropriate descriptions and that of correct namings were counted. (3) Pointing to pictures by names. To examine his ability of listening comprehension of words, we asked him to point to a picture corresponding to a heard word out of 10 within-category exemplars. (4) Pointing to kanji words by pictures. He was required to select a target kanji word from 10 within-category kanji words in response to a picture/color shown by an examiner. (5) Reading aloud kanji words. He read aloud kanji words one by one. (6) Reading comprehension of kanji words. He was asked to select an item from 10 within-category exemplars in response to