

Change of Dialect after Stroke: A Variant of Foreign Accent Syndrome

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Dear Sir,

After a brain injury, patients' phonetic characteristics may change so that listeners perceive them as 'foreign' [1, 2]. Thus, the accent may change from Czech to Polish [3], Norwegian to German [4], American to Irish [5], or Japanese to Korean [6]. This so-called 'foreign accent syndrome' (FAS) has been considered an acquired disorder affecting mainly the prosody of speech. However, there have been no reported cases of a change in dialect following a stroke. We studied a patient who showed a change in accent from one Korean dialect (Cholla-buk) to another (Kangwon). The two dialects are different primarily in their prosody [7], although there is also some difference in lexical segments. However, each dialect is easily understood by people using the other one. We studied the speech characteristics of the patient and discussed the relationship between the phenomenon and FAS.

Subject and Methods

Subject

J.J., a 71-year-old right-handed woman, who had received 6 years of education, was referred to our hospital for further management of the stroke that had developed 20 months before. According to the medical record from the previous hospital, she had no focal neurological problems except for aphasia at the onset of the stroke. MRI performed 7 days after the onset showed an infarct in the left temporal and parietal area (fig. 1). MR angiogram findings were normal. Electrocardiography, chest X-ray and routine laboratory results were within normal limits. We could not obtain de-

tailed information about her previous language deficits, except for the documentation of Wernicke's aphasia. She had not received any rehabilitation therapy for her aphasia.

Most surprisingly, the patient and her family reported that her accent had changed from the Cholla-buk province (located in the southwestern part of the Korean peninsula) dialect to the Kangwon province (located in the northeastern part

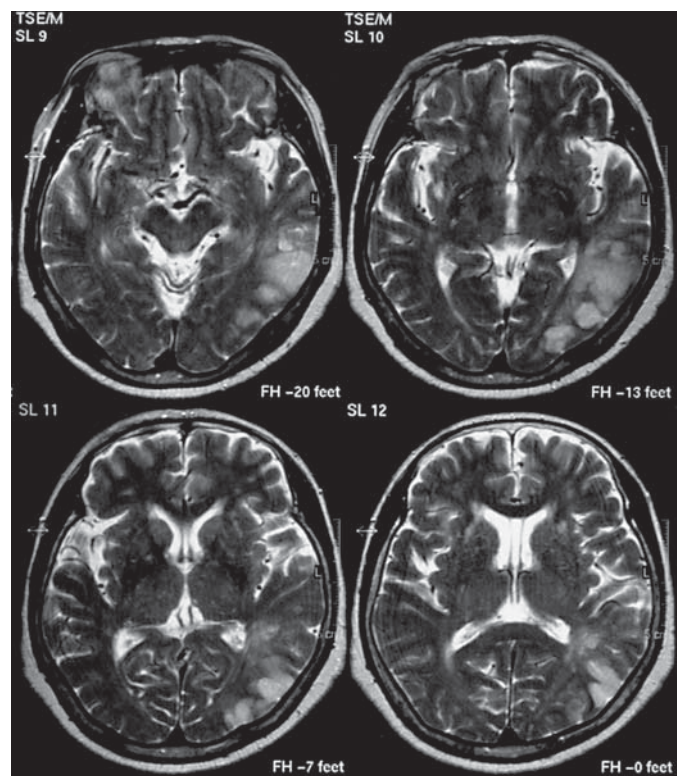


Fig. 1. T₂-weighted MRI showing an infarction in the left temporal and parietal areas.

Table 1. Results of the Korean version of the Western Aphasia Battery

Spontaneous Speech	17/20
Information	8/10
Fluency	9/10
Auditory Comprehension	7.15/10
Yes-no question	42/60
Word recognition	52/60
Following direction	49/80
Repetition	8/10
Naming	6.1/10
Reading	NT
Writing	NT

NT = Could not be tested due to the severe impairment.

of South Korea, adjacent to North Korea) dialect after the stroke. According to her family, she had decreased verbal output right after the stroke, and the altered accent was noticed when she started to speak relatively fluently approximately two days after the onset.

She was born and had lived in Sam-rye, in the Cholla-buk province. Her parents, siblings and husband had all used the Cholla-buk province dialect and had never lived elsewhere.

Assessment of Speech-Language

The patient was alert and fully aware of the change in her accent and the aphasia. She was embarrassed and slightly depressed by the speech problem. However, she was cooperative and did not have significant difficulties in expressing herself to other people despite the aphasia.

The Korean version of the Western Aphasia Battery [8] was administered for assessing receptive and expressive language ability. For perceptual assessment of her speech, 5 listeners aged from 28 to 70 years who were born and raised near Sam-rye, in the Cholla-buk province, for at least 18 years were recruited. All were blinded to her clinical condition and asked to make a judgment on her dialect after listening to J.J.'s spontaneous speech on audiotape. For the tests of affective and linguistic prosody of the patient, 20 short sentences were prepared: 10 for affective and 10 for linguistic prosody. The sentences were emotionally and linguistically neutral. To test the comprehension of affective and linguistic pros-

ody, the sentences were read aloud by an actress in each of the following tones: happy and sad, answer and question. J.J. was asked to listen to the audiotape and differentiate whether it was happy or sad for affective prosody, and declaration or question for linguistic prosody. Her spontaneous speech was transcribed to see the segmental and suprasegmental changes. Acoustic analyses using the wavesurfer 1.6.2 software program were also performed to elucidate the prosodic pattern of her speech. Pitch plots were obtained for spontaneous speech, and they were compared to those of a normal speaker.

Results

Assessment of Aphasia

The result of the Korean version of the Western Aphasia Battery is shown in table 1. J.J.'s spontaneous speech was fluent (9/10), without dysarthria or apraxia of speech. However, she showed intermittent word finding difficulties and occasional paraphasic errors. Naming deficit was prominent with a mildly reduced ability for auditory comprehension and repetition. Reading and writing abilities were severely impaired even at the word level. Therefore, she revealed an anomic type of aphasia with mild to moderate severity (aphasia quotient = 76.5/100).

Perceptual Assessment

When 5 listeners were asked whether her speech was the Cholla-buk province dialect or not, all of them denied it. They were then asked to indicate which dialect she spoke. Two of them identified it as the Kangwon province dialect, while 3 initially stated that it was either the Kangwon or a North Korean dialect. On forced choice, they reported that it was more likely a Kangwon province dialect.

Assessment of Linguistic and Affective Prosody

The tests for expression of affective and linguistic prosody could not be performed due to J.J.'s reading impairment. However, in her spontaneous speech, she did not show any difficulty expressing emotions of surprise, worry and joy. She used an appropriate rising intonation at the end of the sentences for questions. However, she occasionally used a rising intonation for declarative sentences as well. Therefore, we concluded that her affective prosodic expression was intact, but that it may be impaired for linguistic prosody. The re-

sults of the comprehension part of the tests revealed that her affective prosody was relatively intact (18/20), while linguistic prosody was impaired (11/20).

Analysis of Spontaneous Speech

Vowels and consonants in her spontaneous speech were accurate, except for a few paraphasic errors; none of them were unrecognizable. Although rare, a mixed use of words and suffixes from several dialects was observed. For example, [intʃa] (means 'now') and [kuladeye] (means 'said so'), dialects from the Kyongsang province, [sol tʃani] (means 'fairly'), a Cholla-buk province dialect, and [ilə tʃuwa] (means 'let me know'), a Kangwon province dialect, were used. Sometimes, her speech was mixed with bizarre words that did not conform to any dialects.

Acoustic Analysis

J.J.'s speech revealed a unique pattern of intonation that is not observed in the Cholla-buk province dialect. Fundamental frequency plots exhibited that J.J. showed a tendency for large fundamental frequency excursion at the second syllable and at the end of sentences. It was compared to the speech sample of a gender- and age-matched normal control from the Cholla-buk province. The result showed that J.J.'s prosody was a pattern of the Kangwon, but not of the Cholla-buk dialect (fig. 2).

Discussion

This patient developed a change of the accent from Cholla-buk to Kangwon province dialect after an infarction, which was confirmed by relatives and 5 independent listeners. The infarct was on the distribution of the inferior division of the left middle cerebral artery. With normal EKG and MR angiography findings, the etiology of stroke remains unknown. Although embolism from the heart or proximal aorta was suspected, echocardiography was not performed due to the patient's reluctance.

To the best of our knowledge, there has been a single report of dialectal change after stroke [9]. However, considering the characteristics of the Italian language, it should be regarded as bilingual aphasia rather than a change of dialect, as the authors stated. Therefore, our case provides unique opportunity to observe a dialect change after a cerebral infarction. There are different prosodic types in Korean dialects. For example, Seoul or Cholla-buk

province Korean is a fixed stress language, whereas Kyongsang or Kangwon province Korean is a tone language [7]. Premorbidly, J.J. had used a fixed stress language which is Cholla-buk dialect. On acoustic analysis, she showed a large pitch excursion at the second syllable and at the end of sentences (fig. 2), a pattern which is observed in the Kangwon province dialect, but not in the Cholla-buk dialect [10, 11]. Thus, the prosodic pattern was disturbed after the stroke, and the listeners perceived her shifted tone as being Kangwon province dialect.

On prosodic tests, the patient's linguistic prosody was impaired in both comprehension and expression. Previous studies of FAS also demonstrated impairments of linguistic prosody and the use of altered prosody in these patients. However, disturbed phonetic features were diverse among the cases, and FAS has therefore been considered a 'generic' term of perceptual change rather than an acquisition of a particular accent of a foreign language [2, 12, 13]. Based on these studies, we suggest that the change of dialect shown in our patient can be considered a variant of FAS.

Cerebral lesions related to FAS usually involve frontal cortical or subcortical areas [1–6, 13]. Thus, FAS has generally been regarded as restricted deficits on the motor system of speech production due to involvement of the associative motor cortex, basal ganglia or the connection between them [14]. Unusually, our patient had an infarct in the temporoparietal area (fig. 1). FAS occurring after the posteriorly located lesion was reported only in one patient who had a hemorrhage in the left parietal lobe [15]. However, he showed Broca's aphasia. Our patient was exceptional in that she had a prosodic change associated with the posteriorly located lesion and fluent aphasia. Nevertheless, a previous study showed that the posterior-medial part of the supratemporal cortex at the junction with the parietal lobe is linked to speech production rather than perception [16]. This area may have been involved in our patient, which would alter the linguistic prosody at a high level of processing in the programming of speech production.

In addition to the change of prosody, her speech was mixed with various suffixes and words from several dialects. Although segmental changes have been reported in FAS, most of the changes are limited to the problems of timing or tense of articulation [1, 2] rather than lexical alteration. Thus, one may argue that the paraphasias or lex-

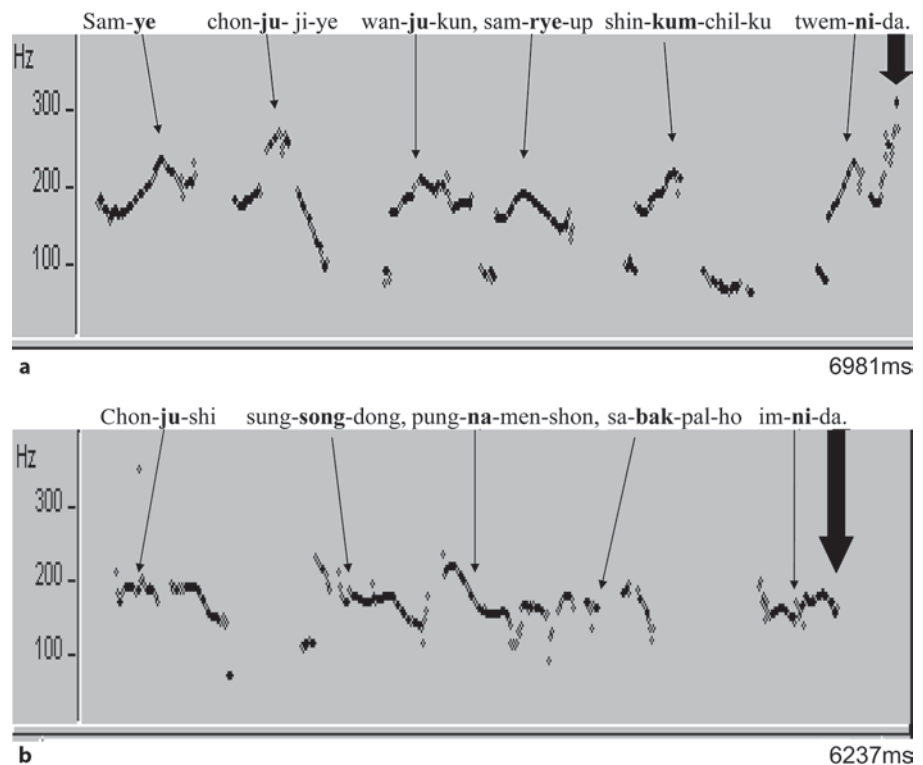


Fig. 2. Fundamental frequency plots of sentences spoken by the patient (a) and a control subject from the Cholla-buk area (b). Both spoke their addresses, meaning 'It is Sam-rye, Jeon-ju. It is Wan-Ju Gun, Sam-rye Eup, Sin-kum 7 Gu' (a), 'It is Jeon-ju City, Sung-song Dong, Pung-na apartment number 408' (b). a Large pitch excursion at the second syllable and at the end of a sentence, which was not observed in b. Thin arrows indicate the pitch of the second syllables (marked with bold letters), and thick arrows indicate the end of the sentences.

ical changes could have made listeners perceive her speech as the other dialect. However, this seems unlikely, since the mixed dialects were only rarely observed. Moreover, the listeners perceived her shifted tone as Kangwon dialect even though she used words and suffixes from still other dialects (i.e. Kyongsang dialect). Therefore, we considered the prosodic alterations as the main cause for the perceptual change of her speech rather than phonemic or morphological changes.

Her use of several dialects may be explained by the concomitant presence of fluent aphasia. There have been reports of pathological mixing or switching of various languages after a brain lesion in bilingual subjects [17]. After the development of aphasia, bilingual patients may rely on both languages for communication to compensate for their impaired linguistic abilities. Although our patient had not

been a competent user of other dialects, it was expected that she had been auditorily exposed to them through mass media. Therefore, the use of multiple dialects may reflect an increased dependence on unaffected language abilities in an effort to fully mobilize the linguistic source in the presence of aphasia. However, she also used bizarre words that did not conform to any particular dialects. Therefore, it may also be speculated that the concurrent presence of paraphasia associated with aphasia may have contributed to this phenomenon.

Acknowledgment

This study was supported by a grant from the Brain Research Center of the 21st Century Frontier Research Program, funded by the Ministry of Science and Technology of Korea (M103KV010010 06K2201 01010).

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