Case Report

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Pure Apraxia of Speech

- A Case Report -

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Apraxia of speech (AOS) is the impairment of motor programming. However, the exact nature of this deficit remains unclear. In particular, AOS without other speech-language deficit is called pure AOS, but it is very rare. When diagnosing AOS, the characteristic of articulation is considered a crucial criterion, which has been proposed for differentiating AOS from phonological and dysarthric disorders. The present study reports on pure AOS in a 37-year-old right-handed male after a left insular, front, temporal infarction. This report may be useful for further AOS study and diagnosis in the clinical setting.

Key Words Pure apraxia of speech, Articulation, Insular

INTRODUCTION

Apraxia of speech (AOS) is defined as a disorder of motor speech programming during speech articulation, which results from cerebral damage. It is usual for symptoms of AOS to be accompanied by other communication disorders including aphasia, whereas it is very rare to show pure AOS without other communication disorders.[1,2]

Articulation characteristics considered in the diagnosis of AOS include highly variable articulation errors, prosodic disorders, and trial-and-error groping articulatory movements with attempts at self-correction.[1,2] Nonetheless, it is not easy to distinguish these characteristics from those of dysarthria.

Another study reported that AOS is neurologically related to the gyrus precentralis and the subcortical structure of the speech dominant hemisphere, and thereby, is related to the anterior insula.[3]

Based on observation of a patient with pure AOS, who did not have difficulties in speech and carry no aphasia, this study describes the characteristics of AOS and gives available information for the clinical diagnosis of AOS.

CASE REPORT

The patient in this study was a 37-year-old right-handed male. He had a university education and had worked as a public officer before the onset of his cerebrovascular

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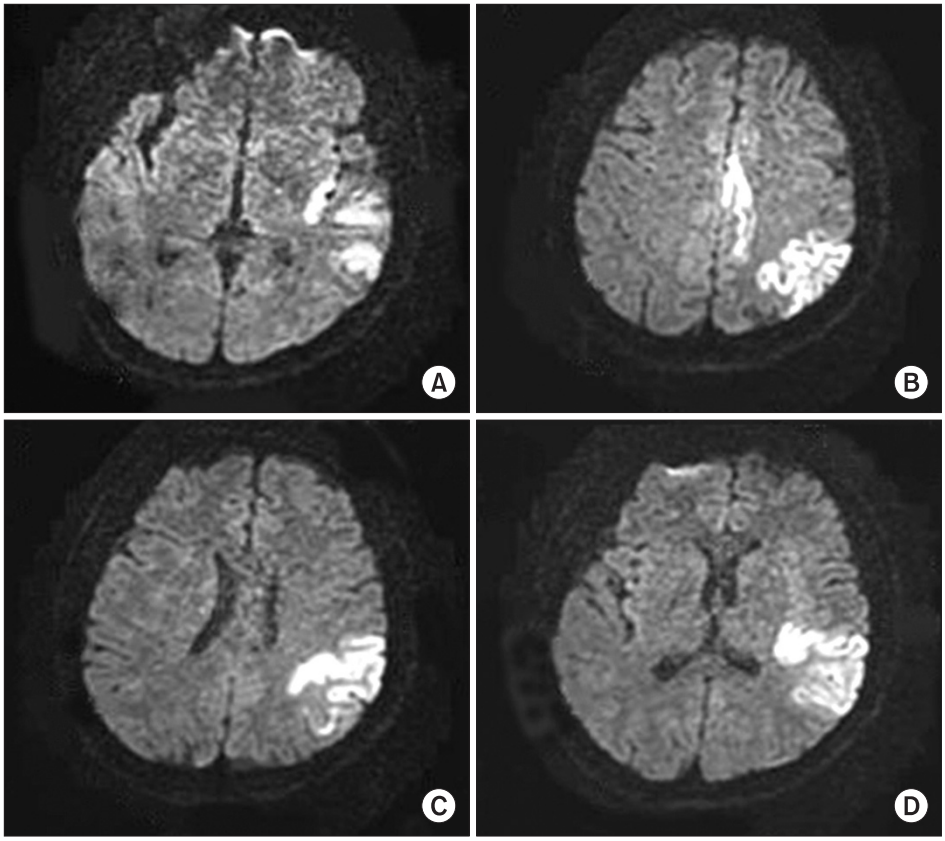

Fig. 1. MRI images show infarcts in the left hemisphere. (A) insular and temporal (B) medial, frontal, and parietal; (C) parietal; (D) temporal.

accident.

His medical history showed a record of arrhythmia in the past but it did not require any special cure in the department of cardiology. He had a right hemiplegia and suddenly could not speak during an exercise session on the eighteenth of October, 2008. At this time, he was diagnosed with an infarction in the left middle cerebral artery (Fig. 1).

Drooling at the right side of the mouth was observed during the first week after onset, but it improved over time. He was lucid and conscious during neurological examination and scored 29/30 points on the Korean version of the Mini-Mental State Examination. On the manual muscle test, the flexor and the extensor of the right shoulder joint were found to be at a Good(-) level, while the flexor and the extensor of the elbow joint were at a Fair level, and the flexor and the extensor of the wrist joint and the knuckle joint were at a Fair(-) level as well. Moreover, the flexor and the extensor of the hip joint were at a Fair(-) level, the flexor of the knee joint was at a Fair(-) level, the extensor of the knee joint was at a Fair level, and the flexor and the extensor of the ankle joint were at a Poor(+) level.

The language evaluation was performed because of frequent articulation errors that were found on the 10th day after the onset of symptoms.

On the Korean version of the Western Aphasia Battery, the information content and fluency of spontaneous speech were recorded at 9/10 points each. Correct responses were shown on the conversation task. The length of utterance was normal, and correct sentence was recorded on the picture explanation task.

All responses were correct on the yes-no questions task, auditory word recognition task, and on the sequential commands task of the auditory comprehension section. Some phrases, especially those with long sentences, were omitted and trial-and-error groping articulatory movements was shown on the repetition task. In the naming section, the object naming task, the word fluency in controlled association task, and sentence completion task, all responses were correct, except for the incorrect response [ʧəŋɲjaŋ] for [səŋɲjaŋ].

Consequentially, the result for fluency was 9/10 points, comprehension (10/10 points), repetition (8.5/10 points),

and naming (9/10 points). The Aphasia Quotient was 92.8 points, which showed that there were no symptoms of aphasia. Furthermore, all responses were correct under oral instruction in the praxis task. Thus, the patient was diagnosed as having no buccofacial apraxia.

The oral function evaluation and articulation test were performed for detailed speech movement evaluation. Oral recording was assessed by the Praat (ver. 5200, Amsterdam, Netherlands) program. This was worked using 44,100 Hz sampling rate and 16 bit quantization, which used a head-worn microphone, Shure WH20 XLR (Shure Radio company, Niles, lllinois, USA) and the external sound card, Sound Blaster SB04090 (Creative Labs, Milpitas, California, USA). The movement of tongue, lip, velum, and jaw were normal for oral function results.

The recorded contents list consisted of the respiratory-phonation test, diadochokinesia (DDK), the increased word articulation test, the same word repetition articulation test, and the paragraph reading test. A printed sheet of the recorded contents list was shown to the patient, which he read.

On the respiratory-phonation evaluation result, the maximum phonation time (MPT) was 32.11 seconds and the voice intensity was 74.43 dB. No problem was diagnosed for respiration because the MPT was maintained for 20 seconds with appropriate loudness of voice.

DDK consisted of sequential motion rate (SMR, /pʌtʌkʌ/) and alternating motion rates (AMRs, /pʌ//tʌ//kʌ/). Each rate was measured three times and the averages of these measurements were calculated. The method for counting syllables was applied to SMR such as AMRs in order to keep time standard.

The results were SMR/pʌtʌkʌ/=12.3, AMR/pʌ/=19.3, AMR/tʌ/=17, AMR/kʌ/=19.6. These results show that the articulations made at the same place would be faster than those at different places.

In the result of the increased words articulation test, the target word [ɕin - ɕinbaɭ - ɕinbaɭʥʰaŋ] was twice found as a correct response, but the target word [itɕʰiŋ - itɕʰiŋʥipʰtɕʰaŋ - itɕʰiŋʥipˀtɕʰaŋmun] was found as an incorrect response showing [itɕʰiŋ, itɕʰiŋʥipˀtɕʰaŋ, itɕʰiŋitɕʰikitɕʰik, itɕʰiŋʥipˀtɕʰaŋmun, itɕʰiŋitɕʰim, itɕʰiŋʥipˀtɕʰaŋ, itɕʰiŋʥipˀtɕʰaŋmun]. Similar to this example, almost all target words were changed to other phonemes, and this is known as the phonemic paraphasia phenomenon. Several self-correcting trials were attempted to amend for these errors. The voiceless pause in a word was observed as [ʥinxɯkˀtʰaŋ__diɭɡ'iɭ] in the target word [ʥinxɯkˀtʰaŋɡ'iɭ].

While repeating the same words in the articulation test, difficulties were found in first syllable utterance such as [pʰun, pʰun, pʰuŋɕən, pʰuŋɕən, pʰuŋɕən] for the target word [pʰuŋsən]. The subject substituting the plosive phoneme for the fricative phoneme was observed as well as repetition of syllables such as following example: [sʷomdatʰaŋ, sʷompʰasʷomsatɕʰaŋtʰaŋ, sʷompʰasʰomsatɕaŋtʰaŋ, sʷomsʷomdatʰaŋ, sʷomsatʰaŋ, sʷomsatʰaŋ] for the target word [sʷomsatʰaŋ].

The patient responded [kəmkjəŋtɕʰaɭgwan, kjəŋtɕʰaɭgwan, kjəŋtɕʰaɭgwan] for the target word [kjəŋtɕʰaɭgwan]. This may be due to the semantic paraphasia phenomenon, because the printed letter of the target word may remind the patient of 'kəmsa (prosecutor)' in the brain.

DISCUSSION

Although the patient preserved the ability to speak for himself, there were articulation errors. On account of this, a misdiagnose of dysarthria, conduct aphasia, or anomic aphasia was possible. If a detail articulation test is performed, AOS confirms that the places of articulation errors happen in different areas, and that this being in the high ratio of self-correction attempts, and in the different errors found throughout each trial. Conversely, with dysarthria the places of the articulation errors are found in the same position.

AOS is defined in cognitive terms as impairment in the translation of phonological representations into specifications for articulation. Therefore, it is a behavioral definition, in which articulation analysis is a more important criteria in the diagnosis of AOS.[1-3]

In the first reported case,[4] the subject did not speak on his own accord and was accompanied by buccofacial apraxia. However, a rare occurrence was found in the present case because the subject could speak freely without aphasia and buccofacial apraxia. Therefore, this case is a more appropriate first case for describing characteristics of AOS.

SMR was slower than AMRs in the DDK result. This case

distinguishes AOS from a patient with Parkinson's disease as hypokinetic dysarthria. SMR was faster than AMRs in patients with Parkinson's disease,[5] and AMRs of AOS, of the normal group, was performed differently in terms of time and intensity.[6] Because AOS is a case report, a comparison of AOS and dysarthria is conjecturable, but AMR may be the most predictable indicator between the groups.

The severity of the AOS symptoms were related to the damage of the Broca's area and the area of the basal ganglia.[7] Insular area[8,9] and the area of the posterior central gyrus[3] are reported as lesions of AOS. Correspondence was seen to this case report through the lesion of the insular and temporal areas.

AOS is defined as motor programming-planning disorders from brain damage, but to date, knowledge of programming-planning procedures are unknown. The case report of AOS given here can be used as real data for the cognitive processes related to speech.

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