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Aprosodias in Indonesian patients with right cerebral hemisphere stroke

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Abstract

This is a study of 15 Indonesian speaking right handed patients a month after a cerebrovascular accident involving the right hemisphere with left hemiparesis. 14 patients had aprosodia; this could be further classified as motor aprosodia (6), transcortical motor aprosodia (4), mixed transcortical aprosodia (2), sensory aprosodia (1) and transcortical sensoric aprosodia (1). Of the 10 patients with CT scan of the brain, 6 patients had cortical lesions and 4 had subcortical lesions. This first study of aprosodia in Indonesian patients showed that aprosodia is common after cerebrovascular accidents involving the right hemisphere.

Key words: cerebrovascular accident, aprosodia, Indonesian

INTRODUCTION

Severe disturbances of language in right handers occur almost exclusively after lesions of the left hemisphere. In contrast, lesions confined to the right hemisphere rarely impair the semantic and grammatical components of language. Therefore, the role of the right hemisphere in language has been considered rudimentary. Language, however, has a third component in addition to semantics and grammar, which is prosody.[1] Monrad Krohn was the first to define "prosody" as the melodic line of speech produced by variations of pitch, rhythm, and stress of pronunciation.[2] In Parkinson's disease, there is "aprosody" which is general lack of prosody as part of akinesia, with masked facies and soft monotonous voice. In hypomania and Broca's aphasics, there is "hyperprosody", which is excessive use of prosody.[3]

In 1979, Ross and Mesulam hypothesized that the right hemisphere is dominant for organizing the affective-prosodic components of language and gestural behaviour and the functional/anatomic organization in the right hemisphere mirrored that of propositional language in the left hemisphere.[3-5] In 1981, Ross showed that the specific combination of affective-prosodic deficits in the right hemisphere was analogous to the functional-anatomic clustering of the aphasics in the left hemisphere and termed these specific syndromes "aprosodias". The same modifiers for aphasias were thus applied to aprosodias, which were motor, sensory, global and transcortical (table 1).[3,5,6] The right hemisphere was also thought to be important in the use of movement of limbs, body and facial movements to color, emphasize and embellish speech (gesture) as well as comprehending their meaning.[4-6] The use and

TABLE 1: Classification of aprosodia

	Spontaneous prosody and gesturing	Repetition	Prosodic comprehension	Comprehension of emotional gesturing
Motor	Poor	Poor	Good	Good
Sensory	Good	Poor	Poor	Poor
Global	Poor	Poor	Poor	Poor
Conduction	Good	Poor	Good	Good
Transcortical motor	Poor	Good	Good	Good
Transcortical sensory	Good	Good	Poor	Poor
Mixed transcortical	Poor	Good	Poor	Poor

comprehension of gesture was thus incorporated in the assessment of aprosodia. [3,5,6]

Bahasa Indonesia is the official language of Indonesia. It is related to the Bahasa Melayu spoken by the Malays in Malaysia and Singapore; Pilipino, the official language of Philippines based on Tagalog, the Chamic languages of Vietnam and Kampuchea, and the aboriginal language of Taiwan. It is thus one of the most widely spoken languages in the modern world. This study aims to assess the occurrence of aprosodias among the Indonesian speakers following a right cerebral hemisphere cerebrovascular accident (CVA).

MATERIALS AND METHODS

Fifteen consecutive patients with CVA with left hemiparesis from the Kudus General Hospital, Central Java were studied. The criteria for the selection of study subjects were: right handedness, no previous history of cortical damage, habitual Bahasa Indonesia speakers and being mentally alert so as to cooperate with the various tests. All patients were examined personally by the author. The cognitive and language functions were assessed clinically. Line Bisection Test was used to determine the visual neglect. CT scan of the brain was performed as far as possible to correlate with the clinical findings. The assessment was done 1 month after the onset of cerebrovascular accident

The evaluation of aprosodias was according to previously described in the literature as follows:[3,5,6]

Spontaneous prosody and gesturing: Observations were made on the prosodic quality of the patient's voice; overall loudness or softness of the speech, the emphasis, intonation, melody and variability of voice. The patient was asked emotionally-loaded questions, such as how he felt about his disability, did he have any close calls with death or maiming, what was his plan for the future, e.g. job. Observations were also made on the patient's spontaneous speech, whether it was "prosodic" or "aprosodic" and the occurrence of spontaneous gesturing.

Prosodic-affective repetition: This was to evaluate of the patient's ability to repeat sentences with affective contents. The patient was first asked to repeat a declarative statement such as "I'm going to the hospital" which was without emotional content. He was then asked to repeat the sentence conveying a happy, sad, angry, surprised and a questioning moods. Repetition ability was judged on how well the patient's fine tones and prosodic variations resemble that of the examiner's.

Prosodic-affective comprehension: The comprehension of the emotional content of a statement was tested with the examiner standing behind a patient to avoid visual clues. The examiner used declarative statements void of emotional words in conjunction with differing affective tones and had the patients identify the projected emotion. The patient was asked to identify the correct choice from five or six multiple choice answers, e.g.: "Was that said in an angry, sad, happy, surprised or fearful tone?"

Comprehension of emotional gesturing: The examiner stood in front of the patient and pantomiming a gesture that involved the face and limbs to convey a particular affective state such as surprise, anger, disinterest, sadness. The patient was then asked to identify the emotion. The patient was also allowed to answer by multiple-choice format.

For each category of affective language described above, 5 commands were given. The grading "good" was given for three or more correct responses, and "poor" was given for two or less correct responses. For those showing abnormality in any of the categories, the aprosodias were further subtyped as shown in Table 1.[3,5]

RESULTS

Fifteen patients were studied. The sex breakdown was: male (9) and female (6). The average age of the subjects was 60 years, with a range of 43 - 73 years. All the patients had a high school education and worked independently until they were incapacitated by the acute illness. All patients had left hemiparesis, the weakness being mild to moderate in a majority of them. 12 patients had left visual neglect. CT scan of the brain was not done in 4 patients because they could not afford it. Table 2 is the summary of the patient characteristics, CT scan abnormality and the aprosody. As shown, 14 out of 15 patients had aprosodia. The aprosodia could be further subtyped as follows: motor aprosodia (6), transcortical motor aprosodia (4), mixed transcortical aprosodia (2), sensory aprosodia (1) and transcortical sensory aprosodia (1). Although patient number 2 was normal when

TABLE 2: Summary of patient characteristics and evaluation for aprosody

No.	Patient (sex/age)	Type of Stroke	CT scan (*)	Evaluation				Type of aprosody
				1	2	3	4	
1	M/63	NHS	R Frontal	–	–	+	+	Motor
2	M/55	HS	SAH	+	+	+	+	–
3	M/60	HS	Internal Capsule	–	+	–	–	Mixed transcortical
4	M/57	NHS	Fronto-parietal	–	–	+	+	Motor
5	M/73	NHS	–	–	+	+	+	Transcortical Motor
6	M/70	NHS	R Parietal	+	–	–	–	Sensory
7	M/70	NHS	R Fronto-parietal-temporal	–	+	–	–	Mixed transcortical
8	M/59	HS	Internal Capsule	–	–	+	+	Motor
9	M/43	NHS	–	–	+	+	+	Transcortical Motor
10	F/55	NHS	Fronto-parietal	–	–	+	+	Motor
11	F/60	NHS	Temporal-parietal	+	+	–	–	Transcortical Sensory
12	F/69	NHS	Internal capsule (Cornu ant)	–	+	+	+	Transcortical Motor
13	F/52	HS	Thalamus	–	–	+	+	Motor
14	F/49	NHS	–	–	+	+	+	Transcortical Motor
15	F/65	NHS	–	–	–	+	+	Motor

M = Male F = Female
HS = Haemorrhagic Stroke
SAH = Subarachnoid Haemorrhage
1 = Spontaneous prosody and gesture
2 = Prosodic-affective repetition
3 = Prosodic-affective comprehension
4 = Comprehension of emotional gesturing
– is "poor" and + is "good".
(*) = CT scan <7 days after onset
NHS = Non-Haemorrhagic Stroke

evaluated for aprosody a month after the onset of the cerebrovascular accident, he was noted to have a flat affect in the first week of illness. Table 3 is a summary of the type of aprosody and the localization of the cerebral lesions according to CT scan. As shown, of the 10 patients with CT scan, 4 of the 6 patients with motor aprosodia had a lesion involving the frontal lobe. The 2 patients with sensory and transcortical sensory aprosodia had a lesion involving the parietal lobe. 4 patients had subcortical lesions with varying manifestations.

TABLE 3: Types of aprosodia and the localisation of lesion (10 patients)

Motor	Sensory	Transcortical Motor	Transcortical Sensory	Mixed Motor Transcortical
Frontal Fronto-parietal Fronto-parietal Capsule Internal Capsule Thalamus	Parietal	Internal Capsule (Cornu ant)	Temporo-parietal	Fronto-parietal-temporal Internal

The following is a report of case 1 who was diagnosed to have motor aprosodia. The patient was a 63 years old right handed man who was admitted in January 1996 with an acute onset of left hemianaesthesia, hemiparesis and dysarthria from a right frontal lobe infarct. On admission, he was also noted to have a flat affect. When evaluated for aprosodia 4 weeks later, his hemiparesis and dysarthria was mild. But he had quite marked left sided neglect. The relatives complained of the patient's change of behaviour to being rather expressionless both in speech and use of gesture. On formal evaluation, his speech was monotonous with little spontaneous prosody even when he discussed his hobby which was playing badminton (patient was a well known badminton coach). His spontaneous gesturing was reduced. The prosodic repetition was also impaired. For the testing of the latter, when he was asked to repeat a statement with anger, he could raise his voice but was unable to modulate it to carry the correct emotion. The prosodic comprehension and comprehension of emotional gesturing were flawless. A repeat examination in three months showed that the patient had mild residual hemianesthesia only. The previous difficulties with spontaneous prosody, gesturing and repetition had completely recovered.

DISCUSSION

This study involving 15 right handed patients with right hemisphere CVA, and 14 demonstrating aprosodia. This is consistent with the belief supported by many clinical studies since 1975, that right hemisphere plays an important role in the affective-prosodic component of language, although it may not be as strongly lateralized as the semantic/ grammatical components of language in the left hemisphere. [4-9] Ross gave another supportive evidence with the study involving 9 right brain damaged patients with aprosodia and 9 left brain damaged patients with dysphasia. When the verbal-articulatory load in the aphasia left brain damaged patients was decreased, there was statistically significant improvement in their ability to produce and comprehend affective prosody whereas no significant change occurred in aprosodic right brain damage patients with similar manoeuvre. [10]

This is the first study of aprosodia among Indonesian patients. Like English, Indonesian is a non-tone language. Chinese is the only other Asian language where aprosodia has been studied.[11] Chinese is an example of a tone language. In a tone language, a word may be pronounced in different tones which would then give rise to different meanings. For example, "ma" in Mandarin means "mother", "numbness", "horse" and "scolding" respectively when pronounced in different tones and is represented by different written idiographic characters. Hughes et al studied 12 Chinese patients with right hemisphere lesions for prosody. In 11 patients, aprosodia was demonstrated. However, the ability to detect semantic tonal difference in these patients was relatively intact. George et al [12] reported the PET scan results of healthy subjects during task involving emotional prosody recognition, and demonstrated activation of right frontal cortex. Both of these studies give further support to the concept that right hemisphere plays a dominant role for organizing affective-prosodic component of language.

This study involving 15 patients with 14 patients showing aprosodia suggests that the dysfunction is common following right hemisphere stroke. Motor aprosodia was the most common type of aprosodia seen and was diagnosed in 6 patients. Hughes et al [11] studied 12 patients, out of which 11 suffered from right cerebral infarct and one had traumatic right cerebral hemorrhage. Aprosodia was seen in 11 patients. Gorelick et al [6] studied 14 patients with right hemisphere stroke, 12 had aprosodia. Starkstein et al [8] studied a series of 59 patients with acute stroke. 49% of the patients showed impaired emotional prosody comprehension, with 32% being classified as severe and 17% mild. There was an association between the aprosody and right hemisphere lesion.

In 4 out of our 14 patients with aprosodia in this study, the causal lesions were subcortical. The association between the subcortical lesions and aprosodia has been noted previously. [6,11,8,13] Thus, aprosodia appears to be common following right hemisphere stroke, although the incidence of the various subtype, the outcome and the relative role of the subcortical versus cortical lesions is still unclear.

Once a physician is familiar with the concept, with some practice, tests for aprosodia can be incorporated into the bedside examination of patients. The recognition of this disability after a stroke is important, as it can interfere with social interaction and thus rehabilitation of the patient. Depression is said to be common after a stroke. Robinson et al have reported post-stroke major depression of 34% at 6 months.[14] non-recognition of aprosodia can interfere with the

accurate diagnosis of post-stroke depression. There could be underdiagnosis as patients with motor aprosodia may be thought to be indifferent to their neurological deficits. There could also be overdiagnosis, as apparent flat affect from a euthymic patient with motor aprosodia may be misinterpreted as being depressed.

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