

Crossed Lexical Type of Alexia with Agraphia

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Abstract

We report a right handed patient with right middle cerebral artery infarct who recovered from aphasia and has persisting agraphia and alexia. The types of errors that he showed were similar in writing as well as reading, characterized by spelling errors that would preserve the phonological form of the target word. The sparing of language functions other than reading and writing suggests the possibility of different language functions being represented in different lobes or the possibility of differential cerebral reorganization for different functions. The co-occurrence of same type of agraphia and alexia, i.e., lexical type raises the question whether reading and writing share a common neural circuit.

Key words: crossed aphasia, lexical alexia , lexical agraphia

Introduction

High incidence of aphasia after left cerebral lesion, indicates that the left hemisphere is dominant for the comprehension and expression of language in approximately 99 percent of right-handed people. This was first reported by Paul Broca when he said “We speak with the left hemisphere (Broca 1865). Broca reached this conclusion after examining more than 25 patients, all of whom had difficulty in expressive language and all of whom had a lesion in the anterior part of the frontal lobe in the left hemisphere. (Berker, Berker & Smith 1986). A right cerebral lesion giving rise to aphasia in a right handed person is called crossed aphasia. Aphasia rarely occurs in right- or left-handed patients with their language representation in right hemisphere. The prevalence of crossed aphasia in right-handed patients with neither family history of left-handedness nor previous history of brain disease is 0.4-3.5% of all aphasic syndromes. (Dewarrat.G.M et.al 2009)

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Alexia (or acquired dyslexia) refers to an acquired disorder in reading caused by brain pathology (Benson and Ardila 1996). Alexia was first reported by Dejerine by publishing two case reports in 1891 and 1892 which was an important mile-stone in the study of alexia (Dejerine 1891; 1892). In the 1891 paper, he described a patient who suffered a cerebrovascular accident that produced some degree of right-sided visual field defect and mild difficulty in naming and in understanding spoken language together with a complete loss of the ability to read. The patient could write nothing but his signature. Spoken language improved, but the alexia and agraphia remained basically unchanged until his death.

One year later, Dejerine reported a second patient who noted an inability to read, but no other language disturbances, and the source of alexia without agraphia was attributed to an infarct that involved the medial and inferior aspects of the left occipital lobe and the splenium of the corpus callosum (Dejerine 1892).

Alexia without agraphia (also known as occipital alexia or pure alexia) and alexia with agraphia (parietal-temporal alexia or central alexia) represent the classic alexic syndromes. A third type of alexia, frontal alexia, which is associated with pathology in the frontal language areas, was proposed by Benson in 1977. Reading difficulties in cases of right hemisphere lesion in a left handed person is called spatial alexia in which the patient shows visuo spatial problems (Kinsbourne and Warrington 1962). These 4 types of alexias (without agraphia, with agraphia, frontal, and spatial) represent the neurologic, classic, or neuroanatomically-based classification of alexias.

During the 1970s and 1980s, psycholinguistic analysis of alexia was developed (Marshall and Newcombe 1973; Caramazza et al 1985) which tried to explain the functional mechanisms underlying alexias. Different models were put forth to explain normal reading process (Coltheart 1993; Friedman 1992). According to these models, after the initial letter identification, reading proceeds along 2 linguistically different routes: (1) the direct route, wherein the written word is associated with a visual word in the lexicon memory; and (2) the indirect route, wherein the written word is transformed in a spoken word following a graphophonemic set of rules, and the meaning of the word is attained through its phonological mediation. If one or the other of these reading systems is altered, different error patterns can be observed.

According to Psycholinguistic models of alexias, alexias can be of two types- central and peripheral alexias (Warrington and Shallice 1980). In central alexias, the patient can perceive a word correctly but has difficulties recognizing it with either semantic or phonological processing. There are three different types of central alexias: (1) phonological, (2) surface, and (3) deep. Peripheral alexias are due to perceptual disturbance which can be of three types: (1) letter-by-letter reading, (2) neglect alexia, and (3) attentional alexia.

In Surface alexia or Lexical alexia the indirect route (graphophonemic) reading system is available to patients, whereas the lexical (direct) route is impaired. It is characterized by the superior reading of regular words and legitimate pseudo-words in comparison to irregular words. Legitimate pseudo-words can be easily read, because they rely on the indirect (phonological) route. The overuse of the preserved phonological route will result in "regularization errors" (Ellis 1993).

There are very few cases reported of a right handed person with a right cerebral infarct showing surface /lexical alexia with agraphia. The case report raises interrogations into the possible neural organization of language in the brain.

Case Description

A 51-year-old right-handed man with right middle cerebral artery infarct had total loss of language. He regained his language after one week. His medical investigation revealed that he had Diabetes mellitus, hypertension and low vitamin B-12. He had intracranial and extracranial atherosclerosis. There was total occlusion of the right internal carotid with 70% occlusion of left internal carotid. No abnormality was found in tests of other cognitive functions, such as praxis, left-right orientation, calculation, finger naming, and spatial attention. Other parts of the neurological examination, including examination of the cranial nerves, motor and sensory functions, and reflexes, were unremarkable. Hearing was normal. He was a post graduate and was working for a private company. On Western aphasia battery (Kertesz. A. 1982), he scored 10 in the subtest of fluency, 9.9 in the subtest of comprehension, 10 in the subtest of repetition and 9.6 in the subtest of naming. His Aphasia Quotient was 97. His reading and writing skills in English were assessed informally. He was found to have writing errors and reading errors which were of lexical type.

For example, island was written as “iland”, should as “shud”, could as “cud”, knife as “nife”, little as “litl”, knowledge as “nolege”

Similar errors were also found in his reading. For example, island was read as “is- land”, attraction as “attract –ion”, honour as “ho- nour” , friend as “fry – end”, often as “of-ten” . His automatic writing and copy writing were normal.

Subjects’ scores in Writing and reading Test

I. Writing	
Automatic writing	10/10
Copy writing	10/10
writing to dictation	
Automatic writing	10/10
Copy writing	10/10
Irregular words	4/10
Nonwords (pseudo- words)	9/10
Regular words-	10/10
II. Reading	
irregular words	5/10
regular words	10/10
non-words	10/10

Discussion

The present study has discussed the case report of a right handed patient with right middle cerebral artery infarct. He recovered his expressive and comprehensive language within a week. Non fluent type of aphasia and other speech disorders like dysprosody, dysarthria, mutism, and neurogenic stuttering have been reported to occur in patients with right hemispheric lesion. (G. M. Dyukova, Zh. M. Glozman, E. Yu. Titova, E. S. Kriushev, A. A. Gamaleya 2010). On the contrary, our patient was fluent with normal expressive and language functions .He had only alexia and agraphia as a sequelae of the infarct when tested after three months. His reading and writing were characterized by errors that would preserve the phonological form of the target word. The sparing of language functions other than reading and writing suggests the possibility

of different language functions being represented in different lobes or the possibility of differential cerebral reorganization for different functions during recovery. The co-occurrence of same type of agraphia and alexia i.e, lexical type raises the question whether reading and writing share a common neural circuit.

Conclusion

The present study is the case report of a right handed patient with right middle cerebral artery infarct who recovered from aphasia and has persisting agraphia and alexia when tested after 3 months. The types of errors that he showed were similar in writing as well as reading. He produced regularization spelling errors that would preserve the phonological form of the target word. The sparing of language functions other than reading and writing suggests the possibility of different language functions being represented in different lobes or the possibility of differential cerebral reorganization for different functions. The co-occurrence of same type of agraphia and alexia, i.e., lexical type raises the question whether reading and writing share a common neural circuit.

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