

LANGUAGE DETERIORATION IN A CASE OF LONG-TERM EPILEPSY

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Abstract

This research employed a case study approach to examine the linguistic features of a 51-year-old woman with lifelong chronic unspecified epilepsy who had been treated with phenobarbital. The patient was also diagnosed with major neurocognitive disorders secondary to epilepsy, mixed anxiety disorder, and moderate depression. This study utilized a linguistic task evaluation protocol for patients with epilepsy, as proposed by Alarcón et al. This protocol guided the selection and implementation of various assessment tools, including the adult neurorehabilitation clinical history format, WAIS-IV listening comprehension tasks, Neuropsi battery language tests, Neurobel adaptation phoneme discrimination subtask, and complementary tests of the Boston test praxias subtest. The findings revealed impairments in oral language, reading, writing, and mathematical ability. These deficits were characterized by difficulties in expressive-comprehensive aspects, conversational and discursive skills, and challenges in automatic reading, reading comprehension, dysgraphia, dysorthography, and arithmetic calculations. Given these results, this study recommends a multidisciplinary neurorehabilitation intervention to enhance the quality of life of patients and their families.

Keywords: Language impairment, epilepsy.

1. Introduction

Epilepsy is a persistent, non-transmissible disorder of the central nervous system (CNS), characterized by recurring seizures. These seizures result from excessive electrical activity in the brain cells, manifesting as brief periods of absence or muscle contractions, ranging from extended and severe episodes. These episodes may involve loss of consciousness and impaired control of bowel or bladder function, stemming from various alterations, including structural, genetic, infectious, metabolic, immunological, and unknown factors (WHO, 2024). The International League Against Epilepsy (ILAE) defines epilepsy as the transient occurrence of signs and symptoms caused by excessive or synchronized neuronal activity. This activity leads to a brain disorder that creates a lasting predisposition to epileptic seizures, along with neurobiological, cognitive, and psychosocial impacts. In clinical practice, this condition is identified by the occurrence of at least two unprovoked seizures, separated by more than 24 h, with a greater than 60% likelihood of recurrence within the next decade, or the presence of an epileptic syndrome (Fernández et al., 2014; Fernández et al., 2021).

Epilepsy ranks among the most prevalent neurological disorders globally, with epidemiological data indicating that five million individuals receive a diagnosis annually. In developed nations, the annual diagnosis rate is approximately 49 per 100,000 people, while in less developed and developing countries, it can reach 139 per 100,000 people. It is estimated that 50 million people worldwide are affected by epilepsy. The mortality rate in Latin American and Caribbean nations is 1.04 per 100,000 residents, exceeding that in the United States and Canada (0.50 per 100,000). This disparity is attributed to factors such as delayed treatment for 4–10 out of every 1,000 individuals, increased risk of endemic diseases such as malaria or neurocysticercosis, higher incidence of traffic accident injuries and birth-

related trauma, and variations in healthcare infrastructure, preventive health programs, and care accessibility (WHO, 2024).

The clinical presentation of epilepsy encompasses a diverse array of signs and symptoms related to the affected cortical regions that define the epileptogenic zone, which helps determine the specific type of epilepsy or epileptic syndrome (Palacios & Clavijo, 2016). The International League Against Epilepsy (ILAE) established a multi-tiered classification system. The first level specifies seizure type as focal, generalized, or of unknown onset. The second level categorizes epilepsy types as generalized, focal, combined, or of an unknown degree. The third level identifies specific syndromes characterized by distinct combinations of seizure types, EEG patterns, and imaging findings (Scheffer et al., 2017). Additionally, the etiology of epilepsy is classified as structural, genetic, metabolic, infectious, immune, or unknown (Pack, 2019). Focal epileptic seizures progress in various stages. The aura phase may include epigastric, sensory, auditory, vertiginous, visual, or painful sensations as well as urinary urgency, orgasmic experiences, and expressions of fear, which serve as cerebral localizing and/or lateralizing indicators. The ictal phase predominantly features motor, autonomic, ocular, facial, and emotional/sexual phenomena along with language disturbances. The post-ictal period is characterized by intensified symptoms such as nose-wiping behavior, cough, unilateral paresis, psychosis, hemianopia, and cognitive-communicative impairments (López et al., 2019).

A systematic review of the literature on cognitive-communicative impairments in epilepsy revealed that 80% of epilepsy patients experience some level of cognitive impairment. Key factors influencing this include childhood seizure onset, extended seizure duration, high seizure frequency, disease progression beyond 11 years, and epileptogenic foci in the frontal or temporal lobes. The primary contributors to cognitive decline are physiological and metabolic changes caused by seizures, the underlying cause of epilepsy, side effects of certain antiepileptic medications, and emotional factors, such as stress, anxiety, and depression (Martínez et al., 2018). Various types of epilepsy are associated with common cognitive issues, including learning difficulties, attention deficits and hyperactivity, intellectual disabilities, reduced attention span, impaired executive functions, slower processing speed, decreased logical-temporal sequencing ability, verbal memory dysfunction, diminished verbal fluency, categorization problems, and misinterpretation of social cues. In addition, deficiencies in conversational and narrative discourse have been observed (Nickels & Wirrell, 2017).

Research by Pérez (2012) (as cited in Fernández, 2021) highlights that language deterioration specifically affects oral production, which is characterized by linguistic errors such as anomic and syntactic paragrammatism. These issues lead to poor communication performance in daily life and affect both expression and comprehension. The situation becomes more complex when speech involves high-frequency words, resulting in defective communication, potentially causing social isolation. Assessing cognitive-communicative impairments in patients with epilepsy requires a comprehensive approach. The care route should begin with obtaining informed consent, followed by anamnesis, clinical history review, neurological and psychiatric evaluations, paraclinical tests, imaging, neuropsychological assessments, and interdisciplinary evaluations by the neurorehabilitation team to establish a differential diagnosis (Contreras et al., 2017; DSM5, 2013). This underscores the importance of presenting evaluative experience in speech therapy practice for individuals with long-standing epilepsy. This approach considers adult language components to determine a communicative diagnostic characterization, contributing to the adjustment or modification of neurorehabilitation treatment.

2. Methods

2.1 Participant

The subject is a 51-year-old married mother of two with formal education who manages the household. Since her youth, she has suffered from an unspecified form of epilepsy, for which she received a daily dose of 100 mg phenobarbital. Her condition was characterized by short-term memory difficulties and loss of bladder control. Imaging studies revealed early degenerative changes in the right parieto-occipital area and right middle gyrus, cerebellar shrinkage, left mastoid inflammation, and sinus infection affecting both maxillary sinuses, the left anterior ethmoid, and frontal regions. The subject received neurological treatment. Furthermore, psychological assessment led to the diagnosis of severe cognitive impairment due to epilepsy, combined anxiety disorder, and moderate depression.

2.2 Evaluation techniques and instruments

To ensure compliance with legal research protocols and to secure the participation of the subject, the adult daughter (caregiver) and the patient were interviewed. They voluntarily signed an informed consent form, establishing the case study research characteristics in line with Colombian ethical regulations for human research (Resolution 008430 of MinSalud, 1993) and the International Declaration of Helsinki (2013). The assessment followed the linguistic task guidelines for epilepsy patients proposed by Alarcón et al. (2022), which outlined standardized methods for describing communicative features. The process begins with anamnesis using the adult neurorehabilitation clinical history format (Contreras et al., 2017). This format explores various aspects, including personal, family, psychiatric, psychosocial, neurological, and economic factors, as well as clinical history, current health status, daily activities, communication history and skills, drug treatments, and interdisciplinary neurorehabilitation. Several tests were administered to evaluate linguistic behavior: listening comprehension tasks from the WAIS-IV scale (Wechsler, 2012), language tests from the Neuropsi battery (Ostrosky et al., 2012), the phoneme discrimination subtask from the Neurobel adaptation by Adrián et al. (2015), and the praxias subtest from the Boston test's complementary tests (Goodglass, 2005). The results were interpreted using standard correction criteria to determine performance levels, culminating in a score summary that characterized the patient's communicative abilities.

3. Results

The patient's communication profile findings are outlined below based on the implementation of standardized assessment techniques.

3.1 Application of the Language Task Assessment Guidelines

As shown in Table 1, the Verbal Comprehension Index results revealed that the patient struggled with several aspects of the verbal reasoning. These challenges include difficulty in providing definitions, identifying conceptual relationships between words, and responding to inquiries related to general principles and social scenarios.

Table 1. Results of the comprehensive language tasks

SUBTESTS	SCALE SCORE	AVERAGE	E.D	QUALITATIVE INTERPRETATION
Similarities	3	10	3	Low
Vocabulary	4	10	3	Low
Information	3	10	3	Low

Table 2 illustrates the patient's expressive language deficits, which were evident through imprecise articulation, grammatical errors, and abnormal prosody accompanied by phonetic and semantic paraphasia. The assessment also revealed impairments in naming, repetition, and comprehension. Moreover, the patient displayed difficulties in semantic and phonological fluency, manifesting as challenges in information retrieval. These issues are characterized by inhibitory processes, delayed responses, and linguistic errors, including

grammatical mistakes, word-finding difficulties, circumlocutions, and both literal and semantic word substitutions.

Table 2. Results of expressive language tasks

TEST	SUBTESTS	DP	NP	DESCRIPTIVE CATEGORY
Language	Denomination	6	-2	Moderate
	Repetition	3	-2	Moderate
	Expression	2	-2	Moderate
	Semantic verbal fluency	3	-3	Severe
	Phonological verbal fluency	0	-3	Severe

Table 3 illustrates the deficiencies in reading and writing abilities. It highlights a tentative automatic reading that relies on tactile perceptual aid, along with subvocalization and oculocephalic disassociation. The table also notes formal guessing strategies and monotonous speech patterns due to challenges in managing suprasegmental aspects, such as rhythm, musicality, and speed, as well as literal comprehension. Furthermore, it indicates writing issues, including graphical mistakes and dysorthography, in both automatic and semantic grammatical writing. Additionally, it points out challenges in abstract thinking and generalization stemming from inadequacies in analyzing and synthesizing mathematical logic in written and mental forms.

Table 3. Results of the reading and writing language and mathematical calculation tasks

TEST	SUBTESTS	DP	NP	DESCRIPTIVE CATEGORY
Reading-Writing and Calculation	Reading	1	-3	Severe
	Dictation	1	-3	Severe
	Copied	2	-2	Moderate
	Mental calculation	0	-3	Severe

Table 4 indicates that the patient's capacity for executing controlled movements deteriorated, both in spontaneous actions and following instructions. Furthermore, the patient presented some challenges in differentiating between similar and dissimilar sound stimuli during auditory discrimination tasks.

Table 4. Results of language-related higher brain function tasks

TESTS	SUBTESTS	DP	PERCENTILE	DESCRIPTIVE CATEGORY
Praxias	Natural gestures	12	40	Below average
	Conventional gestures	11	30	Below average
	Simulated use of objects	24	40	Below average
	Buccofacial	11	40	Below average
Auditory Gnosia	Discrimination of phonemes	7	24	Below average

4. Discussion of the results

The communicative assessment of a patient with chronic undiagnosed epilepsy involved the implementation of a protocol to evaluate linguistic tasks. This approach revealed a decline in oral communication, literacy skills, and mathematical abilities owing to expressive challenges. These challenges stem from various linguistic errors, including paragrammatism, anomia, circumlocutions, and literal and semantic paraphasia. Consequently, the patient experienced deficits in conversational and discourse abilities as well as difficulties in comprehension and meaning. Furthermore, the assessment identified issues in reading and writing, characterized by hesitant reading, monotonous pace, graphical mistakes, and dysorthography. In addition, the patient demonstrated impairments in arithmetic reasoning.

Research on conventional medications, such as phenobarbital, utilized by the patient in question, demonstrates their impact on higher cognitive functions, resulting in cognitive impairment. Studies by Motamedi and Jokeit (cited in Carrizosa et al., 2009; Miziak et al., 2020) directly relate to case study findings, which established that extended phenobarbital use causes more significant harm. This prolonged use is linked to various cognitive deficits in adults, including issues with learning, memory, attention, expressive-receptive language, and problem-solving abilities, all of which are evident in the studied patient's characteristics. Regarding language disorders associated with various forms of epilepsy, scientific evidence outlines specific conditions that share similarities with communicative behavior observed in the case study. This evidence supports the notion that epileptic seizures can, to some extent, affect the brain regions responsible for language function as a cognitive process. Martínez et al. (2018) reported that patients with epilepsy exhibit language deterioration, verbal memory impairments, verbal fluency challenges, categorization deficits, misinterpretation of social cues, conversational skill deficiencies, reading and writing difficulties, and reduced performance in logical-temporal sequencing for mathematical calculations.

Research by Lomlomdjian et al. (2017) indicates that individuals with right temporal lobe epilepsy exhibit deficits in conversational and narrative discourse attributed to disarticulation and pragmatic language skill impairments. Bender del Busto (2018) noted word-finding difficulties but argued against classifying epileptic patients as aphasic unless the seizures stem from specific injuries, such as hemorrhages or brain tumors, affecting the left temporal lobe language areas. Additionally, some patients with focal epilepsy may struggle with language comprehension because of diminished attention and memory processes. Rincón et al. (2012) suggested that patients with epilepsy might experience reading and writing language alterations resulting from impaired cognitive skills, including attention, executive functions, and working memory. These impairments can lead to psycholinguistic and visuospatial short-term memory deficits, manifesting as spelling errors, such as letters, syllables, word omissions, letter reversals, and reading comprehension difficulties. Furthermore, challenges in mathematics, particularly in arithmetic learning, may occur and are characterized by slow performance and mental calculation errors (Aguilar et al., 2006; Baeta et al., 2002; Rincón et al., 2012). Vetri et al. (2023) emphasized that individuals with epilepsy face various challenges related to specific learning and emotional, behavioral, and social disorders. These issues can affect cognitive function, resulting in conditions such as dyslexia, dysorthography, dysgraphia, and dyscalculia, which are specific disorders that affect reading, writing, and mathematical abilities.

5. Conclusions

This case study underscores the importance of evaluating speech therapy outcomes in patients with chronic epilepsy. The assessment revealed impairments in verbal communication, literacy skills, and arithmetic abilities, thereby guiding the development of an interdisciplinary neurorehabilitation strategy aimed at enhancing patients' well-being. By publishing these findings, this research aims to provide valuable insights into both academic

and scientific communities. Furthermore, this study opens up avenues for future investigations, potentially exploring various subject groups and examining different variables within the field of speech therapy and epilepsy management.

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