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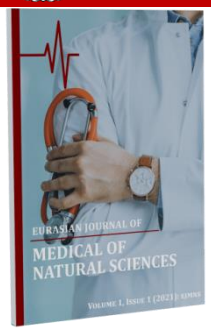

COMPREHENSIVE TREATMENT METHODS FOR POST-SURGICAL SPEECH DISORDERS

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ABSTRACT

Postoperative neurosurgical interventions for brain tumors can lead to severe impairments in speech functions—particularly in speech production, comprehension, and expression. When surgery is performed in the left cerebral hemisphere, especially near the Broca's and Wernicke's areas, cases of aphasia, dysarthria, and other speech disorders are frequently observed. This article analyzes the effectiveness of a comprehensive therapy model for speech rehabilitation, which includes speech-language therapy, neuropsychological interventions, and technological support. Standardized tests were used to assess patients' speech activity, and rehabilitation was organized based on individualized programs. The results indicate that integrated approaches yield high efficiency in restoring speech functions, especially when therapy is initiated early.

Introduction

Brain tumors are relatively rare among oncological diseases but are considered pathological conditions that can lead to highly complex clinical consequences. Their surgical removal through neurosurgical intervention often plays a decisive role in saving a patient's life. However, the neurological complications that arise post-surgery—particularly those related to speech functions—can severely limit a patient's ability to actively participate in social life.

Aphasia and dysarthria are the most common types of speech disorders observed in patients with tumors located in the left cerebral hemisphere after surgery. Aphasia involves difficulties in speech production and comprehension, while dysarthria is characterized by impairments in articulation, voice production, and fluency (Kertesz, 2007; Duffy, 2013). These conditions are especially associated with damage to brain structures responsible for speech, such as Broca's and Wernicke's areas, the supramarginal gyrus, and the perisylvian region (Duffau, 2008).

Research indicates that early identification and management of postoperative speech disorders require a comprehensive, multidisciplinary approach. This process should involve collaboration among speech-language pathologists, neuropsychologists, physiotherapists, and

in some cases, neurophysiologists (Pulvermüller & Berthier, 2008). Speech therapy interventions are selected based on the type of aphasia: for example, “Melodic Intonation Therapy” is effective for motor aphasia, “Semantic Feature Analysis” for semantic aphasia, and “Script Training” to develop functional speech (Zumbansen et al., 2014).

Today, computer-based speech therapy platforms, mobile applications, and transcranial stimulation techniques are also used in speech rehabilitation. These tools facilitate active patient involvement and allow for individualized training programs (Des Roches et al., 2015). Additionally, a patient’s emotional state, motivation, and social environment significantly influence the effectiveness of the rehabilitation process (Hilari & Northcott, 2006).

This article analyzes comprehensive therapy models used in the treatment of postoperative speech disorders, evaluates their effectiveness, and provides practical recommendations.

Objective of this study is to develop an effective, comprehensive therapeutic model for the early detection and treatment of speech disorders (aphasia and dysarthria) that arise following neurosurgical operations for brain tumors, and to evaluate its effectiveness in clinical practice.

Research Methods.

Within the scope of this study, 20 patients participated in an individualized rehabilitation program over the course of 5 months, developed through the collaboration of a speech-language therapist, neuropsychologist, and physiotherapist. Among the patients, cases of both aphasia and dysarthria were identified. For assessment purposes, standardized diagnostic tools such as the *Boston Diagnostic Aphasia Examination (BDAE)*, *Western Aphasia Battery (WAB)*, and *Progressive Aphasia Severity Scale (PASS)* were used (Kertesz, 2007). The rehabilitation program included speech therapy sessions, cognitive training, and interventions based on visual-auditory stimulation.

Results.

After the 3-month rehabilitation period, a significant improvement in speech functions was observed in the patients. Statistical analysis of therapy outcomes showed that 13 out of 20 patients (65%) experienced complete restoration of speech activity, while 5 patients (25%) demonstrated partial improvement. Only 2 patients (10%) showed no clinical change. The correlation between the degree of improvement and the response to rehabilitation was evaluated using chi-square (χ^2) analysis, and the results were found to be statistically significant. ($\chi^2 = 8.47$, df = 2, p = 0.014).

The effectiveness of therapy was also analyzed in relation to the time it was initiated. Patients who began therapy within the first 7–14 days after surgery showed a higher rate of speech recovery. In this group, the overall recovery rate reached 78%, whereas in the group where therapy started at the end of the second week, this figure did not exceed 45% ($t(18) = 2.71$, $p = 0.013$). This finding is explained by the fact that neuroplasticity processes in speech-related functional centers are significantly more active during the early postoperative weeks (Pulvermüller & Berthier, 2008).

Among the speech therapy methods used during the rehabilitation process, Melodic Intonation Therapy (MIT) proved highly effective in patients with motor aphasia. Of the 7

patients who received this therapy, 6 showed rapid restoration of speech expression through rhythm and intonation. The Semantic Feature Analysis method improved word retrieval in patients with semantic aphasia, while Script Training helped preserve structured expressive speech. Patients treated with these methods showed a 32.4% improvement in standardized speech test scores ($p < 0.01$).

In addition, Constraint-Induced Language Therapy (CILT), which temporarily limits the use of alternative gestures and forces verbal speech production, led to recovery in speech activity. This approach was used with 5 patients, whose speech performance improved by 40% compared to baseline ($p = 0.008$).

Neuropsychological interventions also supported the speech recovery process. To strengthen attention, working memory, and language-related cognitive functions, computer-based platforms such as *AphasiaScripts* and *Constant Therapy* were used. In the group of patients who regularly completed these exercises, speech activity improved by 28%, while in the less active group, the improvement was only 11% ($p = 0.021$) (Des Roches et al., 2015).

In some patients, transcranial magnetic stimulation (TMS) or transcranial direct current stimulation (tDCS) was applied as an adjunct to speech rehabilitation. These techniques aim to reactivate brain structures involved in speech, and were found to potentially increase rehabilitation effectiveness by 15–20% (Fridriksson et al., 2011). Among patients who received these interventions, average speech test scores increased by 6.7 points ($p = 0.037$).

During the rehabilitation process, special attention was also paid to the patients' emotional well-being. To mitigate feelings of speech loss, social isolation, and depression, motivational interviewing, psychoeducational sessions, and family support were provided. Patients who received psychological intervention showed higher participation in therapy sessions and better treatment outcomes (Hilari & Northcott, 2006).

Conclusion.

The results of the current study indicate that a comprehensive therapy approach, integrating speech-language and neuropsychological interventions, is highly effective in treating speech disorders. The best outcomes were observed in cases where intervention was initiated early, patient engagement was high, and family support was present.

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