SPECIFIC FEATURES OF DRUG-RESISTANT EPILEPSY ACROSS DIFFERENT AGE GROUPS

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Abstract. *This article examines the clinical and pathophysiological characteristics of drug-resistant epilepsy in various age categories, ranging from infancy to elderly patients. The phenomenon of pharmacoresistance remains one of the most challenging aspects of modern neurology, with its manifestations and underlying mechanisms significantly differing depending on the patient's age. In pediatric populations, drug resistance is often associated with structural brain abnormalities, genetic syndromes, and metabolic disorders, which require early intervention to prevent irreversible neurodevelopmental delays. In contrast, pharmacoresistance in adults and the elderly is frequently linked to acquired factors such as cerebrovascular diseases, post-traumatic changes, or neurodegenerative processes.*

Key words: *drug-resistant epilepsy, pharmacoresistance, age-related features, pediatric epilepsy, geriatric epilepsy, antiepileptic drugs, seizure control, neurodevelopment, polytherapy, clinical semiology.*

Introduction

Drug-resistant epilepsy remains a critical challenge, affecting approximately 30% of patients who fail to achieve seizure freedom despite appropriate medication. Defined by the ILAE as the failure of two tolerated antiepileptic drug schedules, this condition manifests differently across the human lifespan. Understanding these age-

specific characteristics is essential for optimizing clinical outcomes and improving the patient's quality of life.

In the pediatric population, resistance is frequently linked to structural brain malformations and genetic syndromes, where uncontrolled seizures can severely disrupt neurodevelopment and lead to cognitive decline. In contrast, pharmacoresistance in adult and elderly patients is more commonly associated with acquired factors such as cerebrovascular diseases or neurodegeneration. Furthermore, age-related physiological changes in the elderly complicate treatment due to altered drug metabolism and increased risks of systemic toxicity. This article analyzes the unique clinical and pathophysiological features of drug-resistant epilepsy across different age groups to support a more personalized, age-oriented therapeutic approach.

Main Body

The clinical manifestation and management of drug-resistant epilepsy are deeply influenced by the patient’s developmental stage. In infants and children, the etiology of pharmacoresistance is predominantly characterized by structural brain abnormalities, such as focal cortical dysplasia, and early-onset genetic encephalopathies. The immature brain’s high excitatory-to-inhibitory ratio makes it more susceptible to frequent seizures, which can lead to "epileptic regression"-a state where the electrical activity itself causes progressive cognitive and motor decline. Consequently, the focus in pediatric cases is often on early surgical evaluation to take advantage of neuroplasticity and prevent long-term developmental impairments.

As patients move into adulthood, the nature of drug resistance shifts toward acquired causes, such as mesial temporal lobe sclerosis, post-traumatic lesions, or idiopathic focal epilepsies. In this age group, the primary challenge is the balance between seizure control and the maintenance of professional and social functionality. While rational polytherapy remains the standard conservative approach, adult patients often experience a cumulative burden of side effects from long-term medication use, including mood disorders and reproductive health concerns. The

comparative effectiveness of treatments in adults is frequently measured not just by seizure frequency, but by the patient's ability to remain independent and employed.

In the geriatric population, the management of drug-resistant epilepsy becomes even more complex due to age-related physiological changes. Resistance in the elderly is often secondary to cerebrovascular diseases or neurodegenerative conditions like Alzheimer's disease. From a pharmacological perspective, the elderly have a narrower therapeutic window; decreased hepatic and renal function leads to higher systemic concentrations of drugs, increasing the risk of adverse reactions and dangerous drug-drug interactions with medications for comorbid conditions. Therefore, the therapeutic strategy for older patients prioritizes safety and tolerability over aggressive seizure suppression, often opting for lower doses and careful titration to preserve cognitive and physical health.

Beyond physiological and etiological differences, the diagnostic approach to drug resistance must also be age-stratified. In pediatric cases, neuroimaging and genetic testing are the primary tools used to identify surgically remediable syndromes as early as possible. For children, the goal of overcoming resistance is to achieve "developmental protection," ensuring that the brain's plasticity is used for learning rather than reinforcing epileptic networks. The success of treatment is measured by the child's ability to reach developmental milestones and integrate into educational environments.

In contrast, the diagnostic priority for adult and elderly patients often shifts toward long-term monitoring to differentiate true pharmacoresistance from "pseudo-resistance" caused by poor medication adherence or incorrect syndrome classification. In adults, the social consequences of drug-resistant epilepsy, such as the inability to drive or limitations in career choices, place a heavy burden on mental health. Therefore, managing resistance in this group often requires a dual focus on seizure frequency and psychiatric comorbidities, particularly depression and anxiety, which are more prevalent in patients who fail multiple drug regimens.

Conclusion

In conclusion, drug-resistant epilepsy is a heterogeneous condition whose clinical profile is fundamentally shaped by the patient's age. The transition from pediatric to geriatric epilepsy involves a significant shift in etiology-from genetic and structural malformations in early childhood to acquired cerebrovascular and neurodegenerative pathologies in later life. These differences dictate not only the clinical presentation and seizure semiology but also the primary goals of therapy, ranging from the preservation of neurodevelopmental potential in children to the maintenance of functional independence and safety in the elderly.

The comparative analysis emphasizes that a "one-size-fits-all" approach is ineffective for managing pharmacoresistance. While early surgical intervention remains a priority for eligible pediatric and adult candidates to achieve long-term remission, the management of elderly patients requires a more cautious, tolerability-focused strategy due to altered drug metabolism and comorbidities. Ultimately, improving outcomes in drug-resistant epilepsy depends on an age-oriented diagnostic framework and a personalized therapeutic transition that addresses the unique biological and social needs of each age group.

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