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Managing Stroke-Related Epilepsy with Personalized AEDs

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Introduction

Stroke-Related Epilepsy (SRE) is a significant clinical challenge, emerging as a common complication following stroke, particularly in patients with hemorrhagic or cortical infarcts. Defined as recurrent unprovoked seizures occurring after a stroke, SRE affects approximately 5-15% of stroke survivors, contributing to increased morbidity, mortality and reduced quality of life. The pathophysiology of SRE involves excitotoxicity, gliosis and neuronal network reorganization, driven by stroke-induced brain injury, which creates an epileptogenic focus. Effective management of SRE requires balancing seizure control with minimizing the cognitive and systemic side effects of Anti Epileptic Drugs (AEDs), a task complicated by patient-specific factors such as age, comorbidities and stroke characteristics. Personalized AED therapy, tailored to individual risk profiles and clinical needs, has emerged as a promising approach to optimize outcomes. By leveraging insights into SRE risk factors, such as stroke type and lesion location and selecting AEDs with favorable safety profiles, clinicians can enhance seizure management while mitigating adverse effects, addressing the complex interplay between stroke recovery and epilepsy treatment [1].

Description

The management of SRE begins with identifying patients at high risk for seizures, as early intervention can prevent the development of chronic epilepsy. Risk factors include hemorrhagic stroke, cortical involvement, younger age and severe neurological deficits, with studies indicating that up to 30% of patients with hemorrhagic stroke develop seizures within five years. Antiepileptic drugs are the cornerstone of SRE treatment, with newer agents like levetiracetam and lamotrigine preferred due to their efficacy, favorable pharmacokinetics and reduced cognitive side effects compared to older drugs like phenytoin or phenobarbital. Levetiracetam, for instance, acts by modulating synaptic vesicle protein 2A, offering rapid seizure control with minimal drug interactions, making it suitable for elderly stroke patients with polypharmacy. Personalized AED selection considers factors such as renal or hepatic function, potential for drug interactions and patient-specific comorbidities, such as depression or cognitive impairment, which are common post-stroke. Prophylactic AED use remains controversial, with guidelines recommending against routine prophylaxis in ischemic stroke due to limited evidence of benefit and potential risks, such as sedation or delayed recovery. However, in high-risk cases, such as after hemorrhagic stroke, short-term prophylaxis with levetiracetam for 7-30 days is often employed. Monitoring involves regular EEG assessments to detect subclinical seizures and adjust AED doses, ensuring optimal control while minimizing toxicity. Patient education and adherence support are critical, as irregular dosing can exacerbate seizures, particularly in the post-acute stroke phase.

Personalized AED therapy also addresses the long-term management of SRE, focusing on optimizing quality of life and preventing complications like recurrent stroke or disability. For patients with drug-resistant SRE, defined as persistent seizures despite two appropriately chosen AEDs, alternative strategies are explored, including surgical options like lesionectomy or neuromodulation techniques such as vagus nerve stimulation. Advanced neuroimaging, including functional MRI and diffusion tensor imaging, aids in identifying epileptogenic zones and guiding surgical planning. The choice of AED is further tailored based on the patient's lifestyle and cognitive demands; for example, lamotrigine is preferred in younger patients due to its mood-stabilizing properties, while gabapentin may be suitable for those with neuropathic pain post-stroke. Side effects, such as cognitive slowing or fatigue, are closely monitored, particularly in elderly patients, where AEDs like carbamazepine may exacerbate hyponatremia. Pharmacogenomic testing is an emerging tool, identifying genetic variants that influence AED metabolism (e.g., CYP2C19 polymorphisms), allowing dose adjustments to prevent toxicity or treatment failure. Challenges include managing AED withdrawal in patients who achieve seizure freedom, as premature discontinuation can trigger recurrence, while prolonged use increases side-effect risks. Multidisciplinary care, involving neurologists, pharmacists and rehabilitation specialists, ensures a holistic approach, addressing both seizure control and stroke recovery goals [2].

Conclusion

Managing stroke-related epilepsy with personalized AEDs offers a tailored approach to a complex condition, balancing effective seizure control with the minimization of adverse effects. By selecting AEDs like levetiracetam or lamotrigine based on patient-specific factors, such as stroke type, comorbidities and pharmacogenomic profiles, clinicians can optimize outcomes while supporting stroke recovery. Advances in neuroimaging and multidisciplinary care further enhance treatment precision, addressing both epileptogenic and functional challenges. As research continues to refine personalized strategies, including pharmacogenomics and non-pharmacological interventions, the management of SRE holds promise for improving patient quality of life and reducing the long-term burden of post-stroke complications.

Acknowledgement

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Conflict of Interest

None.

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