

ADVANCES IN DIAGNOSIS AND TREATMENT OF HEMORRHAGIC STROKE IN THE PEDIATRIC POPULATION

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Abstract: Recent advances in neuroimaging, critical care, and surgical techniques have significantly improved the diagnosis and treatment of hemorrhagic stroke in children. However, challenges remain in early recognition and long-term management. This article reviews modern diagnostic tools, treatment strategies, and emerging therapies for pediatric hemorrhagic stroke.

Keywords: pediatric stroke, hemorrhagic stroke, neurocritical care, endovascular therapy, microsurgery, pediatric rehabilitation.

Introduction

Hemorrhagic stroke in children differs substantially from adult stroke in terms of pathophysiology, etiology, and prognosis. Over the past two decades, improvements in imaging technology and minimally invasive neurosurgical techniques have transformed clinical practice. Understanding these advances is essential for optimizing patient care.

Modern Imaging Techniques

High-resolution MRI, MR angiography (MRA), CT angiography (CTA), and perfusion studies allow precise localization of hemorrhage and detection of underlying vascular abnormalities. Functional MRI and diffusion tensor imaging (DTI) are increasingly used for prognostication and surgical planning.

Surgical and Endovascular Treatment

Surgery is indicated in selected cases of large hematomas with mass effect or deteriorating neurological status. Treatment options include:

- Microsurgical evacuation of intracerebral hematomas
- Endovascular embolization of AVMs
- Treatment of aneurysms with coil embolization or surgical clipping

Hybrid operating rooms and neuronavigation systems have improved the safety and efficacy of these procedures.

Neurocritical Care

Advances in pediatric intensive care, including intracranial pressure monitoring, multimodal neuromonitoring, and targeted temperature management, have contributed to better outcomes and reduced secondary brain injury.

Rehabilitation and Long-Term Care

Comprehensive rehabilitation programs involving physiotherapy, occupational therapy, speech therapy, and neuropsychological support are critical for functional recovery. Long-term follow-up is required to monitor cognitive development, school performance, and psychosocial adaptation.

Future Directions

Research is ongoing into neuroprotective agents, stem cell therapy, and personalized medicine approaches. Genetic profiling may help identify children at higher risk of hemorrhagic events.

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