

PEDIATRIC HEMORRHAGIC STROKE – ETIOLOGY, CLINICAL FEATURES AND OUTCOMES

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Abstract: Hemorrhagic stroke in children represents a rare but life-threatening neurological emergency. Unlike adult populations, pediatric hemorrhagic stroke is most commonly associated with structural vascular abnormalities and hematologic disorders. Early recognition and appropriate management are crucial for reducing morbidity and mortality. This article provides an overview of the etiology, risk factors, clinical presentation, diagnostic strategies, and outcomes of pediatric hemorrhagic stroke.

Keywords: Pediatric hemorrhagic stroke, intracerebral hemorrhage, arteriovenous malformation, seizures, neuroimaging, pediatric neurology.

Introduction

Pediatric hemorrhagic stroke accounts for approximately 40–50% of childhood strokes, a proportion significantly higher than in adults. The annual incidence is estimated at 1–2 per 100,000 children. Intracerebral hemorrhage (ICH), subarachnoid hemorrhage (SAH), and intraventricular hemorrhage (IVH) are the main subtypes. Despite advances in neuroimaging and critical care, pediatric hemorrhagic stroke remains associated with high rates of neurological disability.

Etiology and Risk Factors

The etiological spectrum of pediatric hemorrhagic stroke is diverse. The most common causes include:

- Arteriovenous malformations (AVMs)
- Intracranial aneurysms
- Cavernous malformations
- Brain tumors
- Hematologic disorders (hemophilia, thrombocytopenia, leukemia)
- Coagulation abnormalities and anticoagulant therapy
- Traumatic and non-traumatic intracranial hemorrhages

Systemic conditions such as congenital heart disease, metabolic disorders, and connective tissue diseases may increase the risk of intracranial bleeding.

Clinical Presentation

Symptoms of hemorrhagic stroke in children vary according to age and location of hemorrhage. Common manifestations include:

- Sudden severe headache

- Vomiting
- Seizures
- Altered сознание (altered consciousness)
- Focal neurological deficits (hemiparesis, aphasia, visual field defects)

In neonates and infants, nonspecific signs such as irritability, bulging fontanelle, and feeding difficulties may predominate.

Diagnostic Approach

Neuroimaging is essential for rapid diagnosis. Non-contrast CT is the first-line modality for detecting acute hemorrhage. MRI with susceptibility-weighted imaging (SWI) provides superior characterization of bleeding and underlying lesions. Digital subtraction angiography (DSA) remains the gold standard for identifying vascular malformations.

Management

Acute management focuses on stabilization of vital functions, control of intracranial pressure, and prevention of secondary brain injury. Treatment strategies include:

- Blood pressure control
- Correction of coagulopathies
- Antiepileptic therapy
- Surgical evacuation of hematoma in selected cases
- Endovascular or microsurgical treatment of vascular lesions

Outcomes

Mortality rates range from 10% to 30%, and up to 60% of survivors experience long-term neurological deficits, including motor, cognitive, and behavioral impairments. Early rehabilitation plays a key role in functional recovery.

Conclusion

Pediatric hemorrhagic stroke is a complex condition with distinct etiologies and clinical features compared to adult stroke. Multidisciplinary management and long-term follow-up are essential to optimize outcomes.

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