

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# **Neurology Lecture IX**

**Abdelrahim Abdrabou**

**Prof . and Head of Pediatric Neurology Unit  
Department of Pediatrics**

**Faculty of Medicine  
Sohag University**

# Hemorrhagic Stroke

- HS includes nontraumatic intracranial hemorrhage and is classified by the intracranial compartment containing the hemorrhage.
- Intraparenchymal bleeds may occur in any location,
- whereas intraventricular hemorrhage may be isolated or an extension of intraparenchymal hemorrhage.
- Bleeding outside the brain may occur in the subarachnoid, subdural, or epidural spaces..

# Potential Risk Factors for Hemorrhagic Stroke in Children

## Vascular disorder

- Arteriovenous malformations
- Cavernous malformations (“cavernomas”)
- Venous angiomas and other venous anomalies
- Hereditary hemorrhagic telangiectasia

- Intracranial aneurysm
- Choroid plexus angiomas (pure intraventricular hemorrhage)
- Moyamoya disease/syndrome
- Inflammatory vasculitis Neoplastic lesions with unstable vasculature
- Drugs/toxins (cocaine, amphetamine)
- Cerebral sinovenous thrombosis

## Blood disorder

- Idiopathic thrombocytopenic purpura
- Hemolytic uremic syndrome
- Hepatic disease/failure coagulopathy
- Vitamin K deficiency (hemorrhagic disease of the newborn)
- Disseminated intravascular coagulopathy

## Trauma

- Middle meningeal artery injury (epidural hematoma)
- Bridging vein injury (subdural hematoma)
- Subarachnoid hemorrhage Hemorrhagic
- contusions (coup and contrecoup)
- Nonaccidental trauma (subdural hematomas of different ages) Iatrogenic (neurosurgical procedures, angiography)  
Rupture of arachnoid cyst

## Clinical presentations

- ❑ vary according to location, cause, and rate of bleeding.
- ❑ Acute hemorrhages may feature instantaneous or thunderclap الصاعقة headache,
- ❑ loss of consciousness,
- ❑ and nuchal rigidity
- ❑ in addition to focal neurologic deficits and seizures.
- ❑ HS can be rapidly fatal.

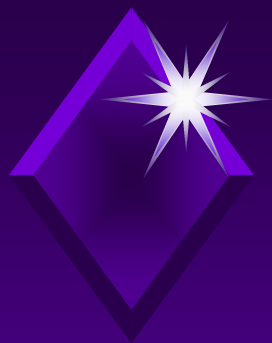
---

## **In bleeds associated with vascular malformations,**

- pulsatile tinnitus,
- cranial bruit,
- macrocephaly,
- and high-output heart failure may be present

- 
- Diagnosis relies on imaging and **CT** is highly sensitive to acute HS.
  - However, **lumbar puncture** may be required to exclude subarachnoid hemorrhage.
  - **MRI** is highly sensitive to even small amounts of both acute and chronic hemorrhage and offers improved diagnostic accuracy.

- 
- Angiography by CT, MR, or conventional catheter means is often required to exclude underlying vascular abnormalities (e.g., vascular malformations, aneurysms)



A healthy 1 mo old presented with sudden-onset irritability followed by focal left body seizures. Plain CT head demonstrates a large hyperdense lesion in the right parietal region with surrounding edema consistent with acute hemorrhage (A). Axial (B) and sagittal (C) contrast CT scans suggest an abnormal cluster of vessels in the center of the hemorrhage consistent with an AVM



**13-60-M**

M:250.00mm(189.52)  
48527 2:9  
135.50mm  
5.0D  
(256,277)



R  
WL=24  
WW=74

Aquilion PF

**KHAN BB 13-60-M**

2017 10 13 16:44:36 532 M:250.00mm(189.52)  
120kV/150mAs 48527 2:10  
0.50s/7mm/1.0x16 142.50mm  
+15.00mm/r 5.0D  
HP15.0 (256,277)



R  
WL=24  
WW=74  
W NO 30  
55Y/F  
SUA/H/VFF

INTERP-5/FC27/ORG//  
NISHTAR HOSPITAL MULTAN Aquilion PF

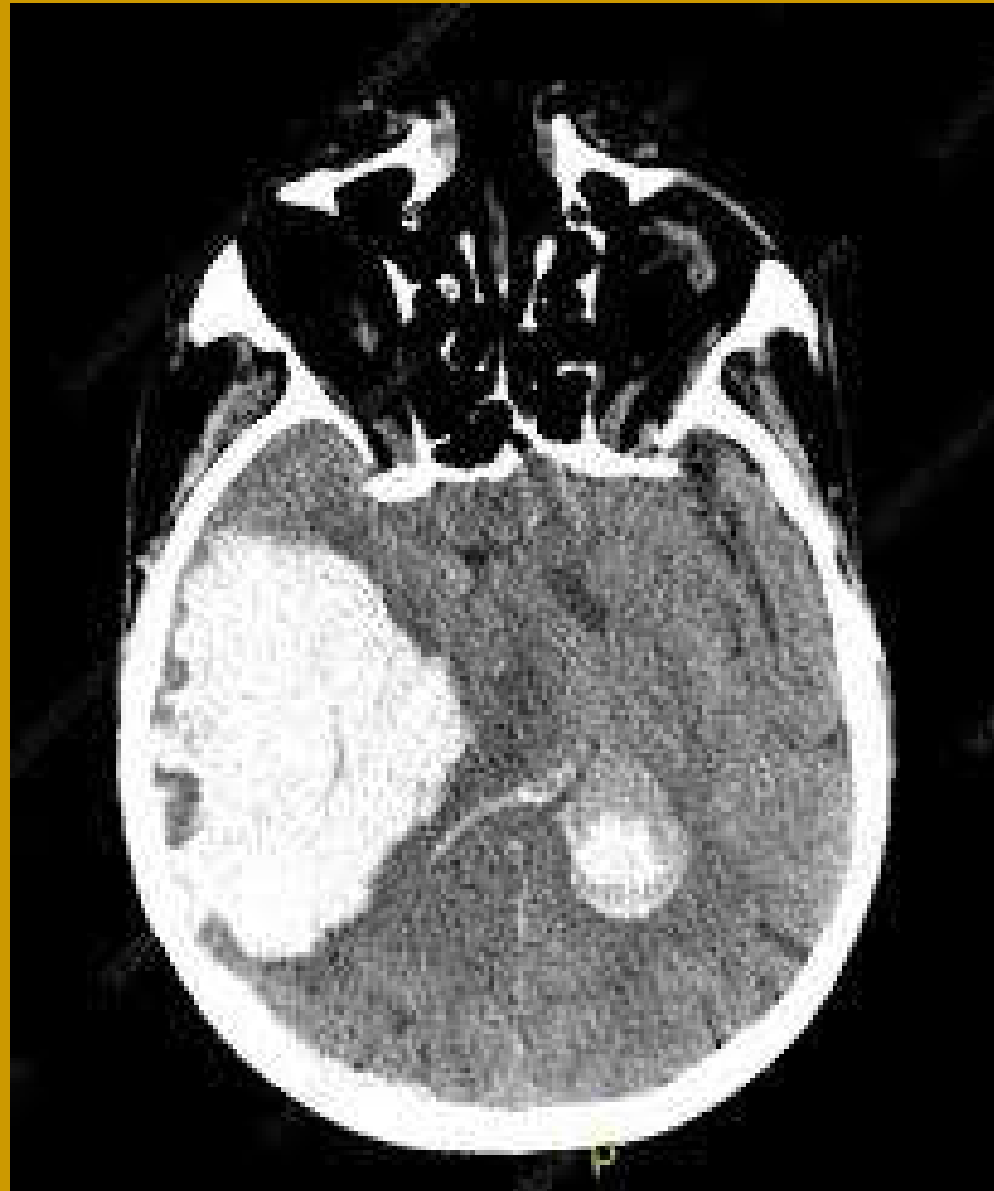
**KHAN BB 13-60-M**

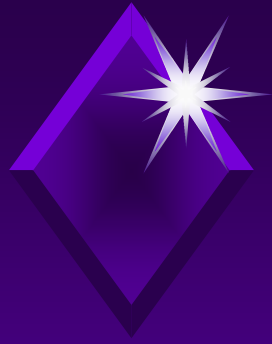
2017 10 13 16:44:36 766 M:250.00mm(189.52)  
120kV/150mAs 48527 2:11  
0.50s/7mm/1.0x16 149.50mm  
+15.00mm/r 5.0D  
HP15.0 (256,277)



R  
WL=24  
WW=74  
W NO 30  
55Y/F  
SUA/H/VFF

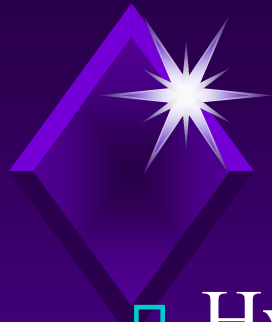
INTERP-5/FC27/ORG//  
NISHTAR HOSPITAL MULTAN Aquilion PF



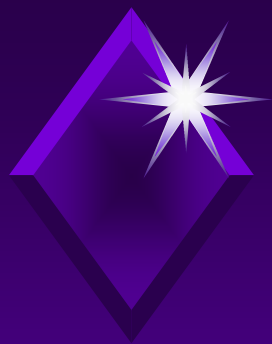


## Management of acute childhood HS

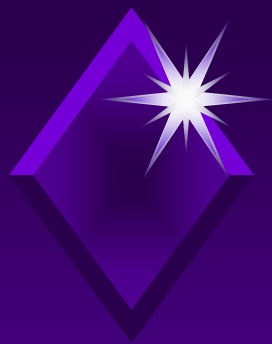
- ❑ may require emergent neurosurgical intervention for large or rapidly expanding hemorrhage.
- ❑ The same principles of neuroprotection for vulnerable brain suggested in the ischemic stroke sections also apply to HS.



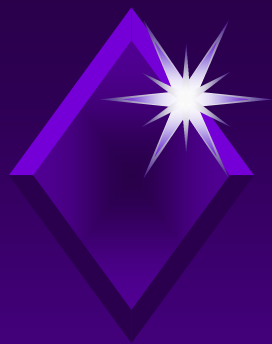
- ❑ Hyperacute neuroprotective strategies
- ❑ These include control of blood glucose,
- ❑ temperature and seizures
- ❑ and maintenance of cerebral perfusion pressure.
- ❑ Early malignant cerebral edema is life-threatening, more common in children and predictable,
- ❑ and emergency surgical decompression can be life-saving.



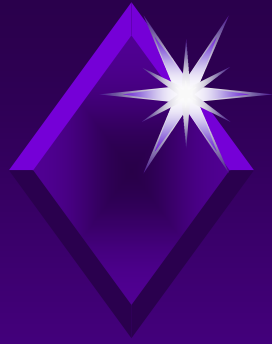
- ❑ Reversal of anticoagulant therapy (with, for example, vitamin K, fresh-frozen plasma) may be required
- ❑ Recurrence risk for those with structural lesions is significant and serial imaging may be required



- Definitive repair or removal of the vascular malformation may require a combined approach with interventional endovascular methods or neurosurgery.



- ❑ Outcomes from childhood HS are not well studied but likely depend on lesion size, location, and etiology.
- ❑ Compared with ischemic stroke, HS mortality is higher while long-term deficits are less common



T2-weighted MRI differentiates the acute hemorrhage from surrounding edema (D). Gradient echo MRI, both acutely (E) and at 3 mo (F), demonstrates the presence of blood product.





**Thank you**