Acute brain attacks

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Top 10 Symptoms and Signs
Frequency in children with acute focal deficits

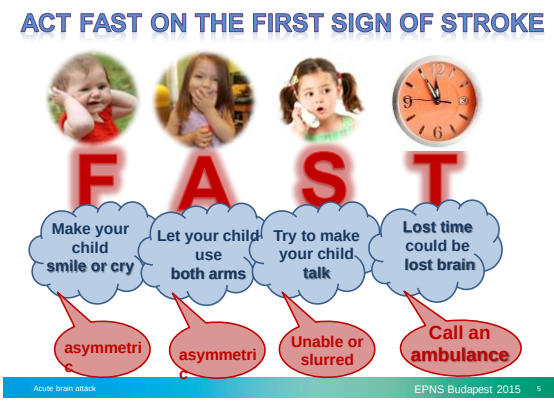
Symptoms/signs	Ranking?
Ataxia	
Visual disturbance	
Headache	
Facial paresis	
Loss of conciousness	
Hemiparesis	
Seizures	
Speech disturbance	
Altered mental state	
Vomiting	

Recognition tools for stroke: FAST
For Paramedics

FAST	AIS total	Anterior circulation	Posterior circulation
Face	70%	76%	42%
Arm	61%	71%	33%
Seech	34%	38%	42%
At least 1	76%	88%	50%

Recognition tools for stroke: Rosier
For Emergency Phycisians

ROSIER		All	Anterior	Posterior
LOC / syncope	-	0	0	0
Seizure	-	17%	17%	17%
Asymm facial weakness	+	70%	82%	42%
Asymm arm weakness	+	61%	73%	33%
Asymm leg weakness	+	57%	67%	33%
Speech disturbance	+	34%	32%	33%
Visual defects	+	10%	6%	17%
Pos Rosier (≥1)		81%	85%	75%



What is your next step?

Magnetic resonance the first choice of imaging

Table 5 Median time intervals (IQR) in hours according to age group from arrival in hospital to first neuroimaging

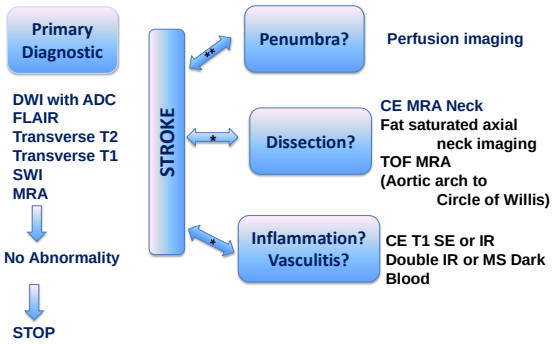
Age group	AIS	HS
<1 year	11.3 (2.4–24.5) (n=11)	1.0 (0.5–1.5) (n=3)
1–5 years	4.5 (2.7–22.5) (n=33)	1.7 (0.7–2.7) (n=6)
6–10 years	2.1 (1.1–4.3) (n=9)	1.4 (0.9–4.7) (n=12)
11–15 years	2.5 (0.7–73.5) (n=15)	1.1 (0.6–1.9) (n=13)
p Value	0.24	0.58

AIS, arterial ischaemic stroke; HS, haemorrhagic stroke.

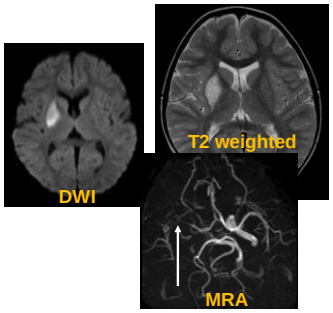
Table 3 Modality and results of first

First neuroimaging modality		
CT		
MRI		
USS		
First neuroimaging was diagnostic of stroke	72 (76%)	40 (95%)
By modality		
CT	43/65 (66%)	39/41 (95%)
MRI	28/28 (100%)	1/1 (100%)
USS	1/2 (50%)	

AIS, arterial ischaemic stroke; HS, haemorrhagic stroke; USS, cranial ultrasonography.



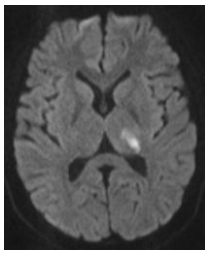
Fast imaging by magnetic resonance !!!!

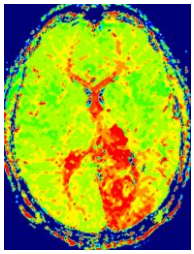


MR >>>CT

- **CT might be negative**
- **Radiation by CT/ CTA**
- **MRA**
  - **perfusion**
  - **Dark blood**
  - **enhanced TOF**
  - **fat suppression**

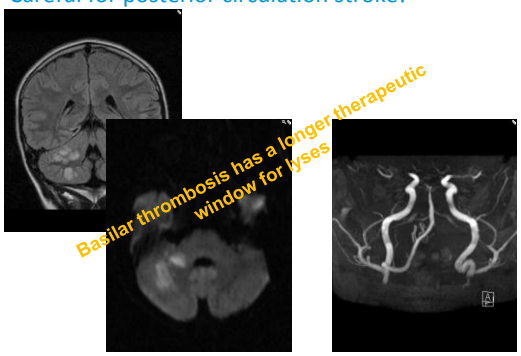
Diffusion – Perfusion Mismatch



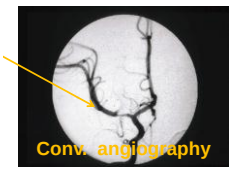


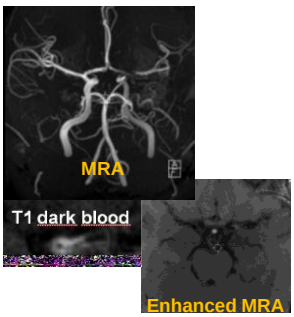
Important for decisions on endovascular interventions

Careful for posterior circulation stroke!

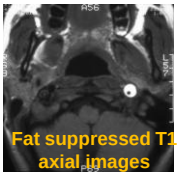


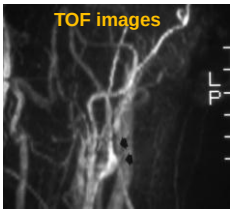
Suspicion of an inflammatory process





Search for dissection



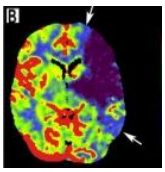


The top 10 aetiologes for acute focal deficits in in children please rank their frequency

	Children	Adults
Bell's palsy		
CNS infection		
Seizures/epilpsy		
Psychiatric		
Cerebellitis		
Encephalopathy		
CNS demyelnation		
Stroke		
peripheral NS		
Migraine		

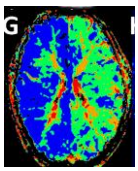
and in adults?

Differential diagnosis stroke versus migraine

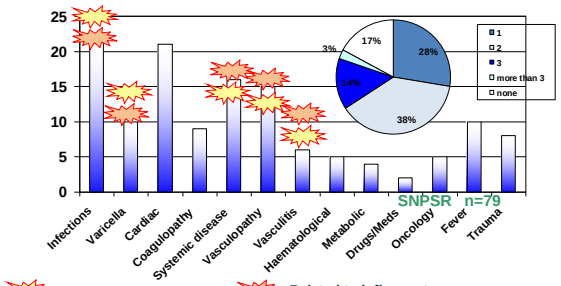


Sudden onset
Stuggering sy
Motor>Sensory
Neglect for sy

Family/personal hx
Jacksonian march
Sensory sy starting
Visual Plus sy
Freightened by sy



Risk factors SNPSR



Suggested investigations

	Results as an emergency	To do at diagnosis	To do at appropriate time
Blood	BC, SR, CRP, electrolytes, glucose, liver and renal function, coagulation, lactate	Viral serology (as Varicella/Herpes simplex/ Mycoplasma/Enterovirus) Borreliosis Vasculitis ? (ESR, ACLA, ANA, LA)	Lipid profile, Homocystein Alipoprotein Prothrombotic studies (Factor V , Prothrombin and MTHRF mut., Protein S and C) Specific investigations
Urine		Organic Amino acids* if supected metabolic!	
CSF	Opening pressure cells, protein, glucose, lactate	PCR varicella other PCR / serologies	

Treatment in First Hours

- Body temperature 36.5-37 °Celsius
- Avoid Hypo- und Hyperglycemia (rare in children!)
- Montoring of level of conciousness
- Blood pressure monitoring
- Treat seizures (in aobut on 20%!)

Symptoms of increased cranial pressure

Thrombolyses and Thrombectomy in children Why considering it?

Pro	Contra
• Outcome 50% with hemiparesis 66% with cognitive problems	• Different aetiologies
• Children not less affected than young adults[n= 24]	• Different Penumbra course? n= 31
• Younger children have higher risk for problems	• Different time course of vessel occlusion?

Thrombolyses and Thrombectomy in children

	Considering in case of	Caveats
Thrombolysis Intravenous / - arterial	Vessel occlusion **and** DW/perfusion mismatch pedNIH >>4; within 4.5 hour time window	Evidence limited to uncontrolled case reports, often not conforming to adult guidelines
Thrombectomy	Large vessel occlusion **and** diffusion/perfusion mismatch pedNIH >>4; within recommended adult time win.	Evidence limited to uncontrolled case reports

Steinlin and Mackay, in press, Ellis et al 2014, Fransen et al 2015

Aspirin versus Heparin

	Indications	Caveats
Aspirin	Baseline treatment 5mg/kg BW	r/o first dissection and cardiac problem
	Positive studies for adults	
Heparinoids*	Extracranial dissection Cardioembolic stroke Negative study for kids	Caution required with large hemispheric or posterior fossa infarction

Steinlin and Mackay, in press, Berge et al 2002, Monagle et al 2011

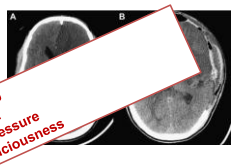
The Role of Steroids?

	Considering in.....	Caveats
Steroids	Focal (transient) arteriopathy Medium to large vessel vasculitis	No evidence
Immuno-suppression	Small vessel vasculitis	

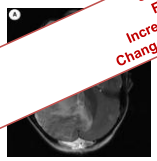
Steinlin and Mackay, in press; Benseler 2014

Decompressive craniotomy in children

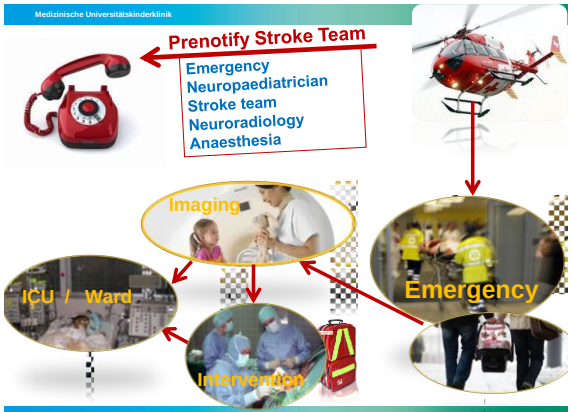
Malignant media infarction
21 children malignant media infarction
aged 1 5/12 – 18y
Glasgow coma scale 4-9;
13/13 dilated pupil;
Craniotomy < 48h in 13 (2-2



Surveillance in ICU
First symptoms:
Increase of blood pressure
Change of level of conciousness



Posterior circulation stroke
11% craniotomy
all within 72hours



Helpful literature

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- Steinlin M. A Clinical approach to arterial ischemic childhood stroke: increasing knowledge over the last decade. Neuropediatrics. 2012;43: 1-9. Review
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- Roach ES, et al «Management of stroke in infants and children: a scientific statement from a Special Writing Group of the American Heart Association Stroke Council and the Council on Cardiovascular Disease in the young.» *Stroke*, 2008: 2644-91.

Helpful literature

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- Ellis MJ et al, „Endovascular therapy in children with acute ischemic stroke: review and recommendations," *Neurology,* Bd. 79, pp. 158-64, 25 September 2012