Krajská nemocnice Liberec, a.s.
Liberec Turnov Frýdlant

TUL

CMP v dětském věku

Zuzana Eichlová, CVSCVP, Neurocentrum - KNL, a.s.
Technická univerzita Liberec, FZS

Liberecké dny UM 30.5.2025

Kryštof 7let

- 23.10.2023 10:00 avizo RZP - chlapec ve škole vyzvednut matkou, asi od 8:30 nehovoří, kulhá na PDK, verifikace od RZP – pád nebyl, beze svědků, nyní vyzvedávám matkou (lékařkou) - leží na pohovce, nehovoří, hemiplegický

- Doporučeno kontaktovat pediatrii – pomůžeme s managementem, pediatr t.č. preferuje transport ad FN MOTOL

- FN MOTOL konzultuje opět RZP – zbytečná časová prodleva, v místě CVSCVP

- 10:30 – rekonzultace s iktovým lékařem – ad CT pracoviště – přivolat pediatra

- 10:40 na CT – neurolog, posádky ZZSLK, matka, pediatr – sedace k CT, provedeny odběry

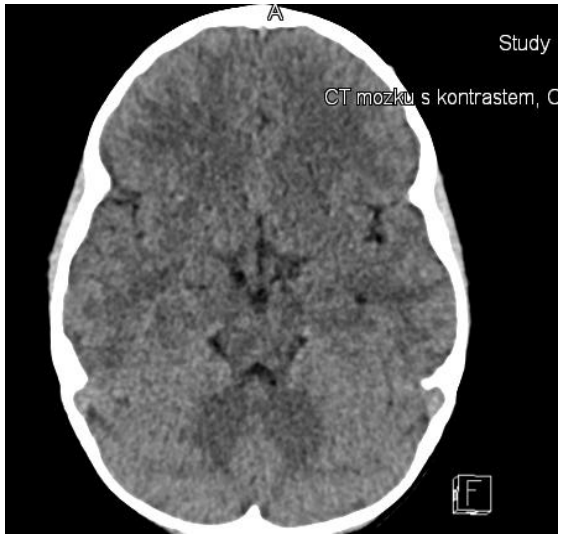
Obj.: TF 123/min, TK 105/60, SpO2 99% za astitence pediatra se sedací .midazolam 2mg IV, calypsol 10mg IV k CT
Hlava: asym koutků, c. paréza n. VII dx, exp. fatická porucha, rozumí, parc. vyhoví, snaží se spolupracovat, klidný, GCS 12 - fatická porucha, ME volné
HKK: Mingazzinni sin udrží, dx pád k pdoložce, čití validěn nelze, tonsu nízká ad dx, taxe nelze, stisk nelze
DKK: Mingazzinni udrží sin, dx pokles k podložce, ppohyb po podložce během manipualce, pokrčí na lůžku,

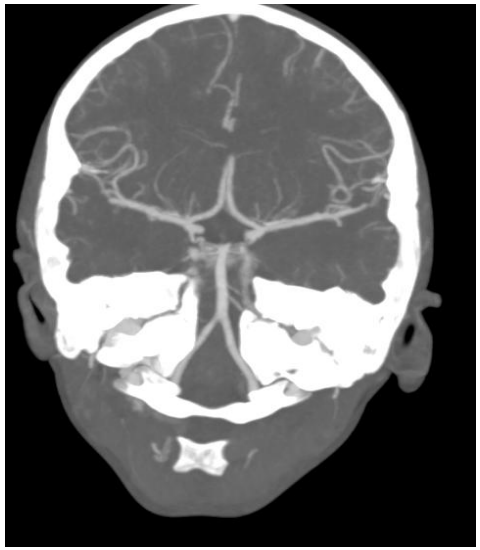
- nativní CT bpn - 11:02 IVT bolus – indikováno 0,9 mg/kg Actilyse - 20 mg IV na 60min - DNT 22min
- CTAg bez akutních uzávěrů

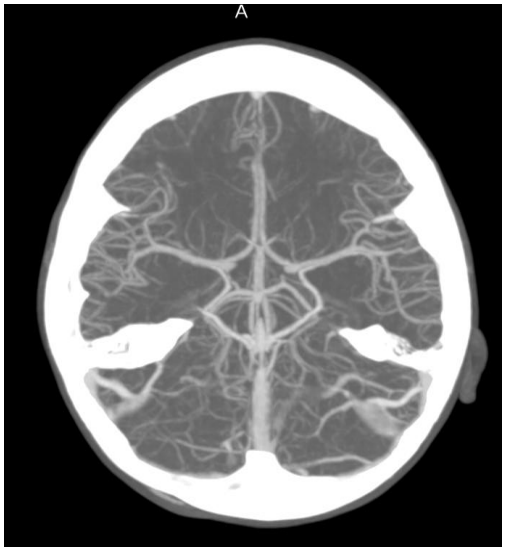
Co dál?

1, NeuroJIP – pouze vybavení pro dospělé, nevyškolený personál

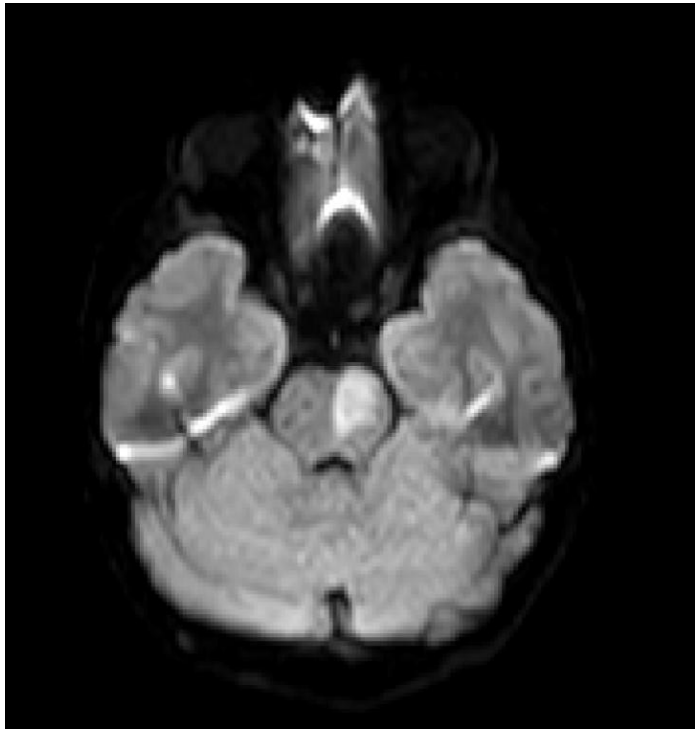
2, DJIP - t.č. preferuje péči vyššího pracoviště - domluven transport ad FN Motol

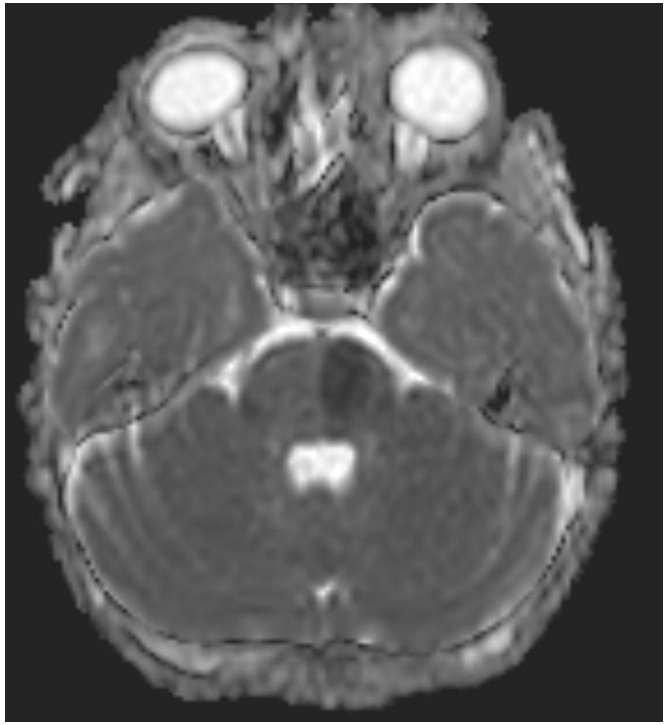






- 11:30 transport via LZS FN Motol – IVT na dokapaní cca 8ml
- 12:26 MR mozku ve FN Motol, stacionární neurologický stav





- Další průběh: 3t pobyt ve FN Motol
- Vyšetření: LP, TTE, TEE, imunologie, hematologie, trombofilní stavy vč. Genetiky
- Intezivní RHC
- TEE - 1mm zkrat PFO

Závěr:

iCMP ve VB povodí, vstupně: dx hemiplegie, anarthrie, c. paréza n. VII dx, NIHSS 16, CT + CTAg negat, MR ischemie v pontu vpravo, PFO +, TOAST 4, A0S0C9O2D0

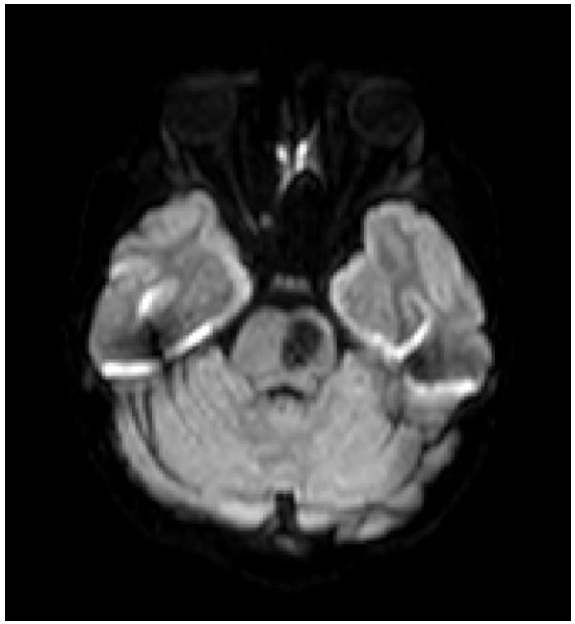
Medikace: Anopyrin 100mg tlb. ½ tbl. denně

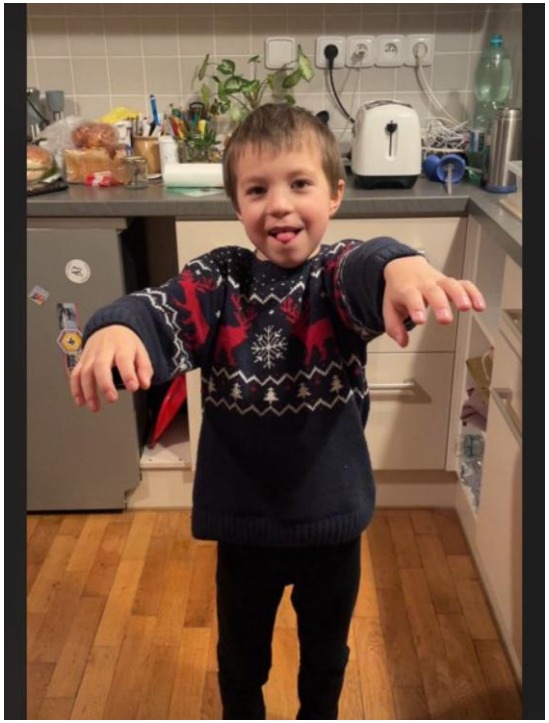
What do you call a flirty Greek philosopher?
Socra-tease

A jak se má Kryštof dnes?

- Při příjmu – dx hemiplegie, těžká léze n. VII dx, anarthrie, NIHSS 16
- Dnes lehká paréza PHK, dominující akrálně, ojediněle přeřekne zadrhne, NIHSS 3, jezdí na kole, lyžuje, má rád vtipy o Řecích

MR 02/2024





- 1/4000 novorozenců
- 2000 starších dětí ročně, 2,5-13/100 000 / rok
- častěji hoši než dívky , kolem 2r věku
- mortalita 10-15%
- vyšší morbidita spojená se opožděnou diagnostikou a pozdním zahájením terapie

[1] Meyer S, Poryo M, Flotats-Bastardas M, Ebrahimi-Fakhari D, Yilmaz U (2017). Schlaganfall bei Kindern und Jugendlichen [Stroke in children and adolescents]. Radiologe, 57:569-576. [PubMed] [Google Scholar]

ETIOLOGIE:

TOAST 1 – ATS změny u dětí nejsou

TOAST 2 – 20% iCMP - PFO, endokarditidy, srdeční vady, …

TOAST 3 – small vessel disease ve smyslu klasické arteriolopatie také ne

TOAST 4 – vaskulitidy, fabry, FCA, CADASIL, antifosfolip. sy., TTP, zánětlivé při VZV, plicní AV zkraty, iatrogenně, perinatálně, tuková x vzduchová embolie, srpkovitá anémie, drogy, ...

TOAST 5 - kryptogenní

Table 1. Risk factors for childhood AIS and HS [4, 24]

Risk factors for childhood AIS
Arteriopathies: focal cerebral arteriopathy, moyamoya, arterial dissection, central nervous system vasculitis
Cardiac disease: congenital cardiac disease, acquired heart disease, isolated PFO, post cardiac surgery (within 72 h), previous cardiac surgery or catheterisation, arrhythmia, extracorporeal membrane oxygenation
Sickle Cell Disease
Infection: varicella zoster, upper respiratory tract infection, multiple infections
Genetic and acquired thrombophilia: factor V Leiden, PT20210, MTHFR c^77T, protein C deficiency, increased lipoprotein (a), high homocystinuria, antiphospholipid syndrome
Other: cervical rib, iron deficiency anaemia, radiotherapy, high alpha 1 antitrypsin, head or neck trauma, under-vaccination, haematological malignancy, trisomy 21
Acute systemic conditions: shock, dehydration, acidosis, hypoxia, fever for > 48 hours, sepsis
Chronic head and neck disorders: migraine, intracranial malignancy, cerebral aneurysm, ventricular shunt, PHACES syndrome
Risk factors for childhood HS
Vascular disorders: arteriovenous malformation, cavernous malformation, cerebral arterial aneurysm, moyamoya
Clotting disorders: severe platelet disorder, low platelet count, severe inherited bleeding disorder, anticoagulation, severe vitamin K deficiency
Sickle Cell Disease
Illicit drug use: amphetamines, cocaine

Table 1

Disorders associated with Pediatric Stroke.

	Gene	Mode of inheritance	Clinical Features	Vascular complications
Marfan Syndrome	Chromosome 15q, FBN1	Autosomal dominant	Ectopic lens, arachnodactyly, aortic dilatations, mitral-valve prolapse, familial aortic aneurysms and dissections, skin and skeletal anomalies- pectus carinatum, pectus excavatum, scoliosis and pes planus	Arterial dissections (vertebral, carotid and aorta)
Pseudoxanthoma Elasticum	Chromosome 16p 13.1, ABCC6	Autosomal recessive	Skin changes	Intracranial aneurysm, dissections, moyamoya -like vasculopathy, small vessel disease
Ehlers-Danlos Syndrome- type IV (mainly associated with vascular complications)	Chromosome 2, COL3A1	Autosomal dominant	Hyperextensible joints, easy bruising skin, vascular lesion	Aneurysm, carotid-cavernous fistulae, dissections
Progeria	Chromosome 1q21.2, LMNA Gene	Autosomal dominant	Premature aging; alopecia lipoatrophy, atherosclerosis, joint	Cardiovascular disease, stroke-involving large
Mitochondrial encephalopathy, lactic acidosis, and stroke-like episodes (MELAS)	mitochondrial DNA; A3243G gene (most common mutation)	Maternal inheritance	Developmental delay, recurrent vomiting, headaches, deafness, muscle weakness. diabetes mellitus, renal disease, short stature, cardiomyopathy	Recurrent stroke-like episodes involving non-vascular territories
Fabry Disease	Alpha Galactosidase	X-linked	Dysmorphic features, anhidrosis, angiokeratomas, acroparesthesia, ophthalmologic complications	Small vessel ischemic disease, intracranial arterial dolichoectasia, intracerebral hemorrhage, cardiogenic embolism
Von Hippel-Lindau Disease	Chromosome 3p25-26, VHL tumor suppressor gene	Autosomal dominant	Pheochromocytomas, renal cell carcinoma, pancreatic cystadenomas, hemangioblastomas (CNS & retinal)	Intracranial hemorrhage, aneurysm
Sturge- Weber Syndrome	GNAQ gene	Somatic mosaic R183Q mutation	Port-wine stain, glaucoma, mental retardation, seizures, contralateral hemiparesis & hemiatrophy	Intracranial hemorrhage

STROKE AWARENESS

Though they are not common, strokes do happen in children, infants and unborn babies. We hope raising awareness about risk factors, signs and symptoms will lead to early identification and intervention which are key factors that contribute to positive outcomes.

Strokes happen in about
1 in 4,000 live births

Since 2003, Children's Medical Center has offered a
comprehensive Stroke Program

Boys and African American children are at higher risk for stroke

Strokes are one of the top 10 causes of death
in children between the ages of 1 and 19 years

11 in 100,000
children between birth through age 18 suffer risks of a stroke per year

Strokes are slightly more common in
children under the age of 2

Approximately
10% of patients with Sickle Cell Disease suffer from strokes

FAST:

An easy way to remember what to look for!

Face – One side of the face gets frozen (so the patient can't smile) or droopy, in which case an eye and the mouth on one side may sag
Arms – The patient can't raise both arms at the same time and keep them up
Speech – Slurred speech
Time – Call 911 immediately if you see any of these symptoms

Factual information resourced from stroke.org, chasa.org and childrens.com

children'shealth®

PEDIATRIC STROKE

Less common than adults, but as common as pediatric brain tumors.

Know the common symptoms of a stroke. There may be treatment if you act **F.A.S.T.**

FACE
F

Face Looks Uneven
Ask the person to smile.
Does one side of the face droop?

ARM
A

One Arm Hanging Down
Ask the person to raise both arms.
Does one side drift downward?

SPEECH
S

Slurred Speech
Ask the person to repeat a simple phrase.

TIME
T

If you observe any of the signs...
call 911 immediately.

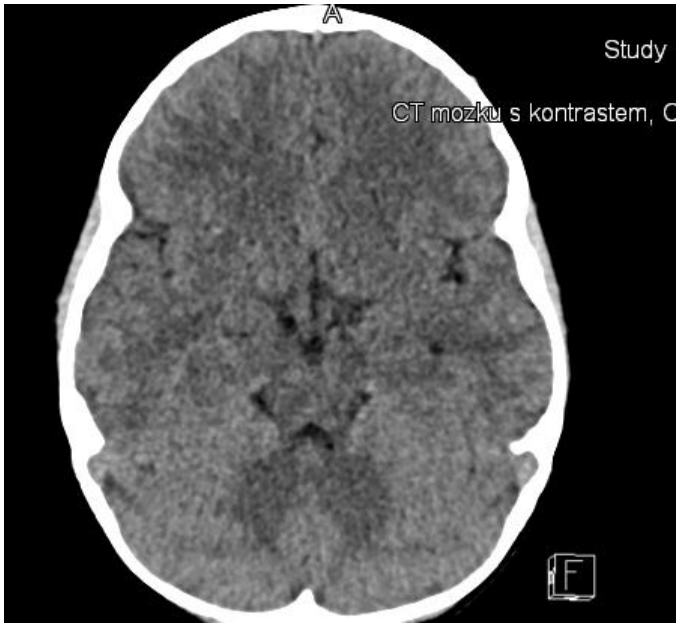
Remember...
Time = BRAIN

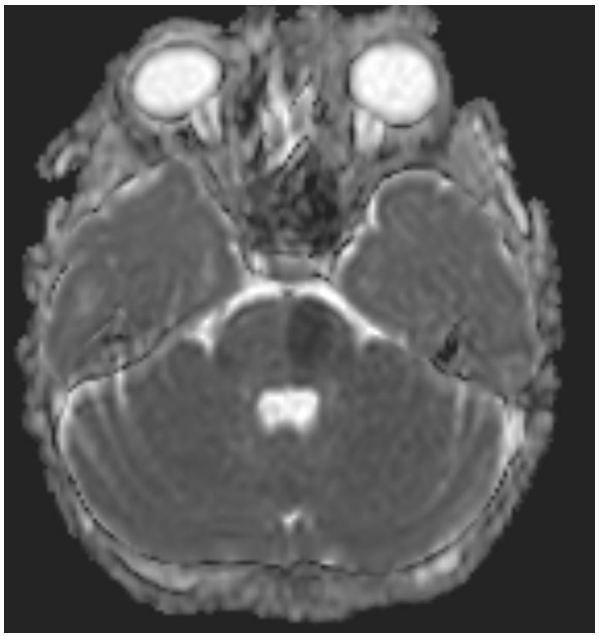
Children's HOSPITAL • ST. LOUIS
BJC HealthCare

Washington University in St. Louis
Physicians

- Preferenční MR – ADC mapy, DWI sekvence - tam kde je zvyklost zavedená

- CTA + CT - v úvodu často negativní, viz Kryštof
  - rychlá, jasná, známá

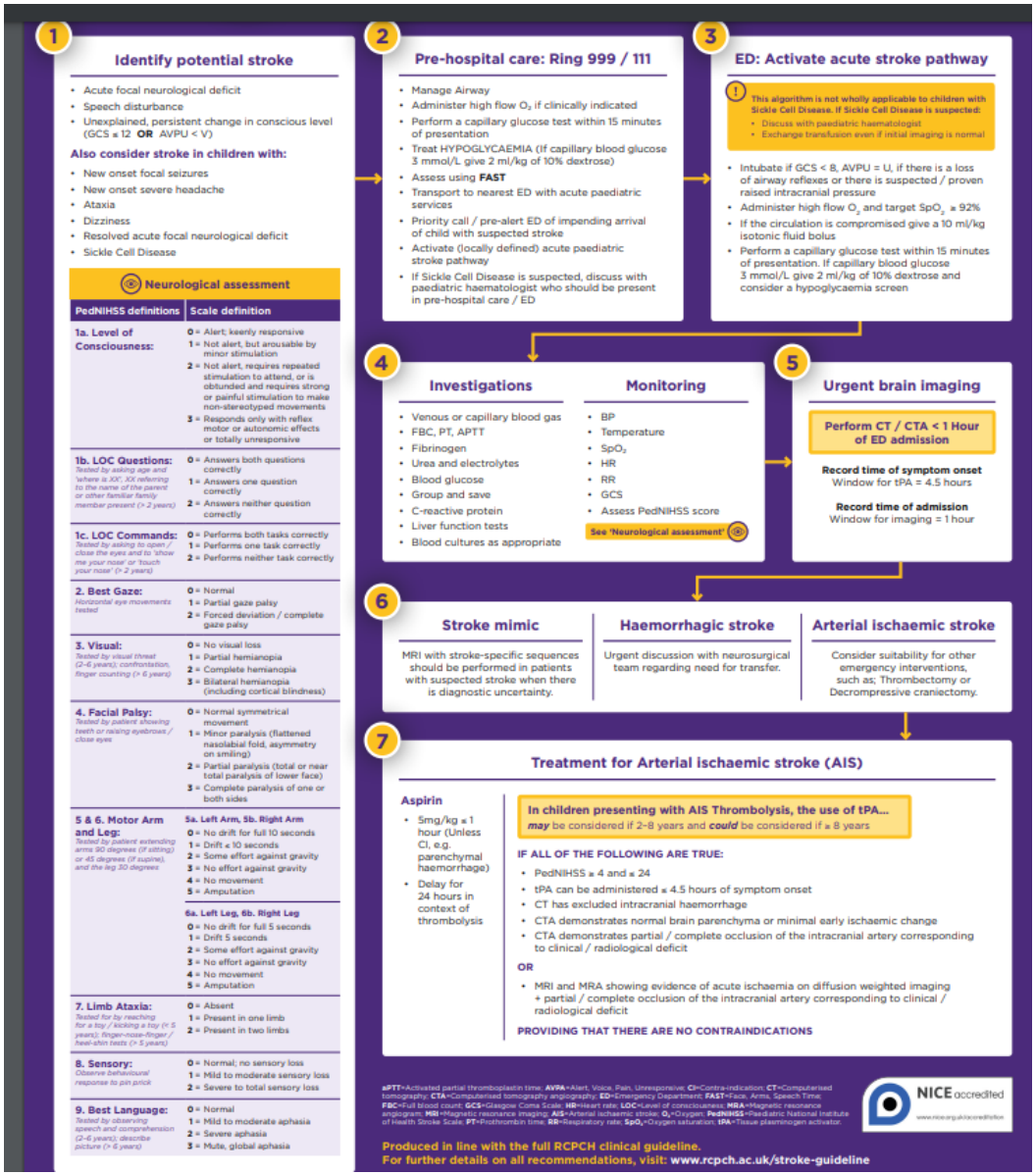




Stroke mimics - až u 40% dle studie TIPS, a až 70% z ostatních zdrojů

- migréna - dotazovat se na RA
- fokální epilepsie
- nádory
- infekční onemocnění - meningitida, encefalitida, absces
- demyelinizační onemocnění
- metabolická onemocnění
- funkční porucha

- ČR nemá guidelines ani metodický pokyn (v přípravě)
- v UK guidelines z r. 2017
- TIPS (thrombolysis in pediatric stroke) studie z r. 2015 – zastavena
- Dávka 0,3-1,2mg/kg, v ČR domluva o 0,9mg Actilyse
- MTE – ano, tam kde je zajištěná dětská neurologie ovládající problematiku



1

Identify potential stroke

- Acute focal neurological deficit
- Speech disturbance
- Unexplained, persistent change in conscious level (GCS ≤ 12 **OR** AVPU < V)

Also consider stroke in children with:

- New onset focal seizures
- New onset severe headache
- Ataxia
- Dizziness
- Resolved acute focal neurological deficit
- Sickle Cell Disease

Neurological assessment

PedNIHSS definitions	Scale definition
1a. Level of Consciousness:	0 = Alert, keenly responsive 1 = Not alert, but arousable by minor stimulation 2 = Not alert, requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make non-stereotyped movements 3 = Responds only with reflex motor or autonomic effects or totally unresponsive
1b. LOC Questions: *Tested by asking age and 'where is XX'. XX referring to the name of the parent or other familiar family member present (> 2 years)*	0 = Answers both questions correctly 1 = Answers one question correctly 2 = Answers neither question correctly
1c. LOC Commands: *Tested by asking to open / close the eyes and to 'show me your nose' or 'touch your nose' (> 2 years)*	0 = Performs both tasks correctly 1 = Performs one task correctly 2 = Performs neither task correctly
2. Best Gaze: *Horizontal eye movements tested*	0 = Normal 1 = Partial gaze palsy 2 = Forced deviation / complete gaze palsy
3. Visual: *Tested by visual threat (2–6 years); confrontation, finger counting (> 6 years)*	0 = No visual loss 1 = Partial hemianopia 2 = Complete hemianopia 3 = Bilateral hemianopia (including cortical blindness)
4. Facial Palsy: *Tested by patient showing teeth or raising eyebrows / close eyes*	0 = Normal symmetrical movement 1 = Minor paralysis (flattened nasolabial fold, asymmetry on smiling) 2 = Partial paralysis (total or near total paralysis of lower face) 3 = Complete paralysis of one or both sides
5 & 6. Motor Arm and Leg: *Tested by patient extending arms 90 degrees (if sitting) or 45 degrees (if supine), and the leg 30 degrees*	**5a. Left Arm, 5b. Right Arm** 0 = No drift for full 10 seconds 1 = Drift ≤ 10 seconds 2 = Some effort against gravity 3 = No effort against gravity 4 = No movement 5 = Amputation **6a. Left Leg, 6b. Right Leg** 0 = No drift for full 5 seconds 1 = Drift 5 seconds 2 = Some effort against gravity 3 = No effort against gravity 4 = No movement 5 = Amputation
7. Limb Ataxia: *Tested for by reaching for a toy / kicking a toy (> 5 years); finger-nose-finger / heel-shin tests (> 5 years)*	0 = Absent 1 = Present in one limb 2 = Present in two limbs
8. Sensory: *Observe behavioural response to pin prick*	0 = Normal; no sensory loss 1 = Mild to moderate sensory loss 2 = Severe to total sensory loss
9. Best Language: *Tested by observing speech and comprehension (2–6 years); describe picture (> 6 years)*	0 = Normal 1 = Mild to moderate aphasia 2 = Severe aphasia 3 = Mute, global aphasia

2

Pre-hospital care: Ring 999 / 111

- Manage Airway
- Administer high flow O_2 if clinically indicated
- Perform a capillary glucose test within 15 minutes of presentation
- Treat HYPOGLYCAEMIA (If capillary blood glucose 3 mmol/L give 2 ml/kg of 10% dextrose)
- Assess using **FAST**
- Transport to nearest ED with acute paediatric services
- Priority call / pre-alert ED of impending arrival of child with suspected stroke
- Activate (locally defined) acute paediatric stroke pathway
- If Sickle Cell Disease is suspected, discuss with paediatric haematologist who should be present in pre-hospital care / ED

3

ED: Activate acute stroke pathway

This algorithm is not wholly applicable to children with Sickle Cell Disease. If Sickle Cell Disease is suspected:

- Discuss with paediatric haematologist
- Exchange transfusion even if initial imaging is normal

- Intubate if GCS < 8, AVPU = U, if there is a loss of airway reflexes or there is suspected / proven raised intracranial pressure
- Administer high flow O_2 and target SpO_2 ≥ 92%
- If the circulation is compromised give a 10 ml/kg isotonic fluid bolus
- Perform a capillary glucose test within 15 minutes of presentation. If capillary blood glucose 3 mmol/L give 2 ml/kg of 10% dextrose and consider a hypoglycaemia screen

4

Investigations

- Venous or capillary blood gas
- FBC, PT, APTT
- Fibrinogen
- Urea and electrolytes
- Blood glucose
- Group and save
- C-reactive protein
- Liver function tests
- Blood cultures as appropriate

Monitoring

- BP
- Temperature
- SpO_2
- HR
- RR
- GCS
- Assess PedNIHSS score

See 'Neurological assessment'

5

Urgent brain imaging

Perform CT / CTA < 1 Hour of ED admission

Record time of symptom onset
Window for tPA = 4.5 hours

Record time of admission
Window for imaging = 1 hour

6

Stroke mimic

MRI with stroke-specific sequences should be performed in patients with suspected stroke when there is diagnostic uncertainty.

Haemorrhagic stroke

Urgent discussion with neurosurgical team regarding need for transfer.

Arterial ischaemic stroke

Consider suitability for other emergency interventions, such as; Thrombectomy or Decrompressive craniectomy.

7

Treatment for Arterial ischaemic stroke (AIS)

Aspirin

- 5mg/kg ≤ 1 hour (Unless CI, e.g. parenchymal haemorrhage)
- Delay for 24 hours in context of thrombolysis

In children presenting with AIS Thrombolysis, the use of tPA...
may be considered if 2–8 years and ***could*** be considered if ≥ 8 years

IF ALL OF THE FOLLOWING ARE TRUE:

- PedNIHSS ≥ 4 and ≤ 24
- tPA can be administered ≤ 4.5 hours of symptom onset
- CT has excluded intracranial haemorrhage
- CTA demonstrates normal brain parenchyma or minimal early ischaemic change
- CTA demonstrates partial / complete occlusion of the intracranial artery corresponding to clinical / radiological deficit

OR

- MRI and MRA showing evidence of acute ischaemia on diffusion weighted imaging + partial / complete occlusion of the intracranial artery corresponding to clinical / radiological deficit

PROVIDING THAT THERE ARE NO CONTRAINDICATIONS

aPTT=Activated partial thromboplastin time; **AVPA**=Alert, Voice, Pain, Unresponsive; **CI**=Contra-indication; **CT**=Computerised tomography; **CTA**=Computerised tomography angiography; **ED**=Emergency Department; **FAST**=Face, Arms, Speech Time; **FBC**=Full blood count; **GCS**=Glasgow Coma Scale; **HR**=Heart rate; **LOC**=Level of consciousness; **MRA**=Magnetic resonance angiogram; **MRI**=Magnetic resonance imaging; **AIS**=Arterial ischaemic stroke; O_2=Oxygen; **PedNIHSS**=Paediatric National Institute of Health Stroke Scale; **PT**=Prothrombin time; **RR**=Respiratory rate; SpO_2=Oxygen saturation; **tPA**=Tissue plasminogen activator.

NICE accredited
www.nice.org.uk/accreditation

Produced in line with the full RCPCH clinical guideline.
For further details on all recommendations, visit: www.rcpch.ac.uk/stroke-guideline

- Nutná kooperace neurolog/pediatr nebo dětský neurolog
- Zvýšit povědomí veřejnosti (Kryštofa nechali 2h ležet - mamince řekli, že asi upadl a napadá na nožičku)
- Nezájem ze strany např. vyučujících na ZŠ se o problematice něco dozvědět
- Potřebný národní metodický pokyn

Abstract Number - 2: Intravenous Thrombolysis for Pediatric Ischemic Stroke: Twenty Years of Population-Level Data in the United States

Alis J Dicpinigaitis, Steven D Shapiro, Rolla Nuoman, Haris Kamal, Philip Overby, Gurmeen Kaur, Ji Y Chong, Johanna T Fifi, Neha Dangayach, Eliza C Miller, Shadi Yaghi and Fawaz Al-Mufti

Originally published 11 Mar 2023 | https://doi.org/10.1161/SVIN.03.suppl_1.002 | Stroke: Vascular and Interventional Neurology. 2023;3:e12438

Abstract

Introduction

Although intravenous thrombolysis (IVT) represents standard-of-care treatment for acute ischemic stroke (AIS) in eligible adult patients, definitive evidence-based guidelines and randomized clinical trial data evaluating its safety and efficacy in the pediatric population remain absent from the literature. We aim to evaluate the utilization and outcomes IVT for the treatment of pediatric AIS using a large national registry.

Methods

Weighted hospitalizations for pediatric (<18 years of age) AIS patients were identified in the National Inpatient Sampl during the period of 2001 to 2019. Complex samples statistical methods were performed to assess unadjusted and adjusted outcomes in patients treated with IVT or other medical management.

Results

Among 13,901 pediatric AIS patients, 270 (1.9%) were treated with IVT monotherapy (median age 12.8 years). IVT-treated patients developed any intracranial hemorrhage (ICH) at a rate of 5.6% (n = 15), and 71.9% (n = 194) experienced favorable functional outcomes at discharge (to home or to acute rehabilitation). Following propensity-sc adjustment for age, acute stroke severity, infarct location, and etiological/comorbid conditions, IVT was not associate with an increased risk of any ICH [5.6% vs. 5.4%, p = 0.931; adjusted odds ratio (aOR) 1.01, 95% confidence interva (CI) 0.48, 2.14, p = 0.971], nor with favorable functional outcome (71.9% vs. 74.5%, p = 0.489; aOR 0.88, 95% CI 0.6 1.29, p = 0.511) in comparison with other medical therapy.

Conclusions

Twenty years of population-level data in the United States demonstrate that pediatric AIS patients treated with IVT experienced high rates of favorable outcomes without an increased risk of hemorrhagic transformation.

REVIEW ARTICLE

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Polish Journal of Neurology and Neurosurgery
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ISSN 0028–3843

Paediatric stroke — a review of current guidelines for diagnosis and treatment

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[2]*Department of Child Neurology, Medical University of Warsaw, Poland*

ABSTRACT

Stroke, increasingly recognised in children in recent years, is an important cause of long-term morbidity and disability. It can be classified by the stroke type as either arterial ischaemic stroke (AIS), haemorrhagic stroke (HS), or cerebral sinovenous thrombosis (CSVT). Furthermore, perinatal and childhood stroke can be distinguished. A wide range of conditions associated with paediatric stroke has been identified, which differ significantly from those in adults. A paediatric stroke can also present with a variety of symptoms and signs, both specific and non-specific. Because of the diversity of the underlying risk factors, limited awareness among the medical community, and therefore insufficient recognition of paediatric stroke symptoms, diagnosis can be difficult and is often delayed. This limits access to acute interventions. The goal of this paper was to examine the current guidelines for the diagnosis and treatment of paediatric stroke.

Key words: arterial ischaemic stroke, paediatric stroke, management, guidelines

(*Neurol Neurochir Pol 2020; 54 (2): 116–124*)


ZAPOJTE SE
O KAMPANI
SEZNAMTE SE S HRDINY FAST
KAMPAŇ V AKCI
Česká republika
PŘIHLÁŠENÍ
REGISTRACE
SEZNAMTE SE S HRDINY
SKLESLÝ OBLIČEJ
SLABÁ PAŽE
NEZŘETELNÁ MLUVA
Naši tři superhrdinové v důchodu a jejich vnuk mají všichni jednu superschopnost, které nám pomohou si zapamatovat nejčastější příznaky mrtvice. A používají tísňové číslo, kterým se volá sanitka, jako nápovědu pro snazší zapamatování příznaků.
Například v Evropě naši hrdinové učí rodiny, aby si zapamatovaly tři nejčastější příznaky mrtvice tak, že je spojí s čísly v evropském tísňovém čísle:
1 polovina OBLIČEJE, která náhle začne KLESAT
1 RUKA, která náhle ZESLÁBNE
2 RTY, které najednou nedokážou MLUVIT


RUČOUN SILNÝ
Někteří hrdinové jsou tak silní, že dokážou zvednout celé auto jen jednou rukou. Ale když zaútočí zlá sraženina, i ten nejsilnější hrdina může v jedné ruce náhle ztratit svou superschopnost.
1


112
ČAS
JE NEJLEPŠÍ
ZBRAŇ PROTI
MRTVICI