Imitateurs et caméléons de l’AVC chez les jeunes et les très âgés

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Outline

• Stroke mimics and chameleons
• Two exemplary cases
• General rules to differentiate them
• Mimics and chameleons in old and young patients
Stroke mimics and chameleons

A. Stroke mimic: symptoms ...
   – That look like stroke
   – But are caused by another disease

B. Chameleon stroke: symptoms ...
   – That look like some other disease
   – But are caused by stroke

C. Simultaneous presence...
   – of acute stroke and of
   – another acute neurological condition

Over-diagnosis of stroke (« imitator »)

Under-diagnosis of stroke (missing strokes)

« Stroke plus syndrome »
Incidence of stroke mimics and chameleons

A. Stroke mimic:
- Prehospital / ambulance personnel: 20-50%
- Emergency room physician: 10-20%
- Neurologist: 2-5%

B. Chameleon stroke:
- Emergency room physician: 2-5%?
- Neurologist: 1-3%?

C. Simultaneous presence...

Mimics: Mazighi Curr Opin Neurol 2012; Oostema Stroke 2015; Chameleons: Richoz Neurology 2015
Example case 1- 34 year old woman

• Good health, no comorbidities
• While doing fitness acute onset of thunderclap headache and loss of consciousness
• GCS 6 according to paramedics, GCS 4 in peripheral stroke unit
• CT → CHUV
Brain CT

Case 1
Transfert to CHUV

• Top of the basilar syndrome

• \(\rightarrow\) IV thrombolysis at +2h from symptoms onset

• Admitted to ICU
Follow-up

Case 1

**CTA baseline**

MRI-TOF follow-up

**BA**

**R SCA**

**L SCA**

**L PCA**

**R PCA(f)**

**R SCA**

**BA**
And the headache?
Example case 2 - 87 years old man

- Living alone, independent for daily activities, CMS help (to wear compression stokings in the morning)

- Known for:
  - arterial hypertension
  - atrial fibrillation anticoagulated by apixaban
  - smoking stopped (40 UPA)
Example case 2 - 87 year old man

• Found at 8h by CMS person with left hemiparesis and dysarthria (last seen well the morning before, but onset likely shortly before he was found)

• In the ER:
  – awake, oriented, no other speech deficit except dysarthria, left multimodal neglect
  – no visual field deficit
  – right-sided eyes deviation
  – left central facial palsy, left-sided severe hemiparesis
Acute MRI

DWI

ADC
Epilepsy: also a radiological mimic

DWI  ADC  PWI

Tmax
HOW TO IDENTIFY MIMICS AND CHAMELEONS
« Classical » stroke presentation

• Exact onset can be determined

• Definite history of focal neurological symptoms
  – Deficit attributable to right or left brain
  – Stroke localisation possible (anterior/posterior/lacunar)

• No previous cognitive impairment

• No abnormal findings in other systems

Hand et al. Stroke 2006
How to detect acute ischaemia?

Sensitivity for acute ischemic stroke on **CT** and **MRI**

- **CT** in lacunar strokes
- **DWI** in lacunar strokes
- **CT** in territorial strokes
- **DWI** in territorial strokes
- **CT-Perfusion** in any stroke

How to detect acute ischaemia?

Sensitivity for acute ischemic stroke on CT and MRI

- DWI in territorial strokes
- DWI in lacunar strokes
- CT in territorial strokes
- CT-Perfusion in any stroke

→ MRI globally better to diagnose stroke (and imitators)
→ If CT-based imaging: do CTP whenever possible

Stroke mimics and chameleons
= The differential diagnosis of stroke & TIA

- Seizure (focal, or Todd’s phenomenon)
- Migraine with aura
- Acute vertigo of peripheral or other origin
- Transient global amnesia
- (Pre-) Syncope / systemic hypotension, orthostatisme
- Psychiatric / conversion syndrome
- Other focal brain lesion (MS plaque, subdural, tumor...)
- Hypertensive encephalopathy / Posterior reversible leukoencephalopathy
- Meningitis / encephalitis
- Systemic metabolic and infectious causes, intoxications
  - Decomposition of old lesions
  - Confusional state
  - Stupor / coma
Caractéristiques cliniques des atteintes neurologiques aiguës / transitoires du CNS

**AVC**
- Début variable
- Absence de signes objectifs
- Non-concernement
- Démonstrativité à l'examen
- Antécédents psychiatriques et psycho-sociaux

**Epilepsie partielle**
- Progression sur sec. - 1min
- Phénomènes positifs (clonies, paresthésies)
- Parfois perte de connaissance / amnésie
- Antécédents épilepsie, OH

**Migraine + aura**
- Progression sur 3-15 min
- Phénomènes pos. ou négatifs
- Apparition 2° de céphalées
- Pas de baisse de vigilance
- Antécédents de migraines

**Lipothymie / Syncope**
- Progression sur sec. - 1min
- Symptômes lipothymiques généralisés
- Baisse vigilance rare
- Ev. orthostatisme

**Amnésie globale transit.**
- Début rapide
- Amnésie profondes pour des données récentes
- Mémoire autobiogr. OK
- Pas de signes focaux
- 50% episode stressant avant

**Malaise psychogène**
- Début variable
- Absence de signes objectifs
- Non-concernement
- Démonstrativité à l'examen
- Antécédents psychiatriques et psycho-sociaux

Autres : hypoglycémie, poussée SEP, état confusionnel.
Stroke mimics: *really a major issue in practice?*

Patients with stroke mimics:

- Will be assessed in emergency, which will often be useful, because mimics are usually other neurological disorders *needing an urgent management*.
- Are not likely to undergo *mechanical thrombectomy* because they have no large-vessel occlusion.
- May receive an inappropriate treatment with rt-PA, but in this case, they have a very *small risk of thrombolysis complication*.
- Some risk of inappropriate use of available facilities.

*D Leys et al. Arq Neuropsiquiatr 2020*
Patients with stroke chameleons:

- May present as acute peripheral vertigo, peripheral nerve palsy, seizure, movement disorders, acute behaviour disturbances
- But have undiagnosed strokes that may be disabling
- Risk of under-treatment:
  - identified with delay and may not receive necessary reperfusion therapies
  - not identified at all and do not benefit from secondary prevention measures
Stroke chameleons: stroke presentations frequently misinterpreted

<table>
<thead>
<tr>
<th>Clinical presentation</th>
<th>Wrong diagnosis</th>
<th>Localisation of stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertigo and ataxia, with/without nystagmus</td>
<td>Peripheral vertigo</td>
<td>Cerebellar or lower brainstem stroke</td>
</tr>
<tr>
<td></td>
<td>BPPV</td>
<td>(Wallenberg)</td>
</tr>
<tr>
<td></td>
<td>Gastroenteritis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>«Spell/malaise»</td>
<td></td>
</tr>
<tr>
<td>Decreased level of consciousness</td>
<td>Metabolic coma</td>
<td>Bi-thalamic, midbrain</td>
</tr>
<tr>
<td></td>
<td>Intoxication</td>
<td>(“top of the basilar syndrome”)</td>
</tr>
<tr>
<td></td>
<td>Epileptic seizure</td>
<td></td>
</tr>
<tr>
<td>Single extremity paresis (face, arm, leg)</td>
<td>Radial palsy</td>
<td>Frontal juxta-</td>
</tr>
<tr>
<td></td>
<td>Plexopathy</td>
<td>(cortical)</td>
</tr>
</tbody>
</table>
### Stroke chameleons: stroke presentations frequently misinterpreted - 2

<table>
<thead>
<tr>
<th>Clinical presentation</th>
<th>Wrong diagnosis</th>
<th>Localisation of stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aphasia, apraxia</td>
<td>Confusional state</td>
<td>Left MCA</td>
</tr>
<tr>
<td></td>
<td>Psychogenic</td>
<td></td>
</tr>
<tr>
<td>Amnesia</td>
<td>Transient global aphasia.</td>
<td>Anterior thalamus, anterior ACA, other</td>
</tr>
<tr>
<td></td>
<td>Psychogenic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Confusional state</td>
<td></td>
</tr>
<tr>
<td>Confusional state</td>
<td>Metabolic confusional state</td>
<td>Thalamus, right MCA/PCA</td>
</tr>
<tr>
<td>Behavioral change, abulia</td>
<td>Depression</td>
<td>ACA, head of caudate, thalamus</td>
</tr>
<tr>
<td></td>
<td>Psychogenic</td>
<td></td>
</tr>
</tbody>
</table>
### Multivariate analysis comparing stroke-chameleons vs. strokes

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>OR (95% CI)</th>
<th>p Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (for 1-y increase above 18 y)</td>
<td>0.98 (0.96-0.99)</td>
<td>&lt;0.01</td>
<td>Younger</td>
</tr>
<tr>
<td>Pretreatment with hypolipidemic drugs</td>
<td>0.29 (0.09-0.97)</td>
<td>0.04</td>
<td>Less statins</td>
</tr>
<tr>
<td>NIHSS score on admission (for 1-point increase)</td>
<td>0.99 (0.96-1.04)</td>
<td>0.99</td>
<td>Lower NIHSS</td>
</tr>
<tr>
<td>Eye deviation</td>
<td>0.21 (0.05-0.94)</td>
<td>0.04</td>
<td>Less eye deviation</td>
</tr>
<tr>
<td>Diastolic blood pressure</td>
<td>0.98 (0.96-0.99)</td>
<td>0.04</td>
<td>Lower BP</td>
</tr>
<tr>
<td>Cerebellar stroke</td>
<td>3.78 (1.87-7.63)</td>
<td>&lt;0.01</td>
<td>More cerebellar strokes</td>
</tr>
</tbody>
</table>

Richoz et al. Neurology 2015
### Patterns in the diagnostic process leading to missing acute ischemic strokes

<table>
<thead>
<tr>
<th>Pattern</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke symptoms attributed to another disease&lt;sup&gt;a&lt;/sup&gt;</td>
<td>38 (80.8)</td>
</tr>
<tr>
<td>Attributed to another neurologic disease&lt;sup&gt;a&lt;/sup&gt;</td>
<td>20 (42.6)</td>
</tr>
<tr>
<td>Attributed to nonneurologic disease&lt;sup&gt;a&lt;/sup&gt;</td>
<td>8 (17.0)</td>
</tr>
<tr>
<td>Unexplained decreased level of consciousness</td>
<td>10 (21.3)</td>
</tr>
<tr>
<td>Stroke symptoms attributed to a concomitantly present condition&lt;sup&gt;b&lt;/sup&gt;</td>
<td>9 (19.1)</td>
</tr>
<tr>
<td>Attributed to concomitant neurologic condition&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5 (10.6)</td>
</tr>
<tr>
<td>Attributed to concomitant psychiatric condition&lt;sup&gt;b&lt;/sup&gt;</td>
<td>4 (8.5)</td>
</tr>
</tbody>
</table>
Stroke chameleons: risk factors, circumstances, and outcomes

<table>
<thead>
<tr>
<th></th>
<th>AIS-C</th>
<th>AIS</th>
<th>Unadjusted OR (95% CI)</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>47</td>
<td>2,153</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Favorable outcome</td>
<td>23 (50.0)</td>
<td>1,273 (61.6)</td>
<td>0.62 (0.35-1.12)</td>
<td>0.21 (0.09-0.46)</td>
</tr>
<tr>
<td>Mortality</td>
<td>14 (30.4)</td>
<td>402 (19.4)</td>
<td>1.81 (0.95-3.43)</td>
<td>4.37 (1.81-10.54)</td>
</tr>
<tr>
<td>Recurrent ischemic cerebrovascular event</td>
<td>6 (13.3)</td>
<td>195 (9.9)</td>
<td>1.40 (0.59-3.35)</td>
<td>1.68 (0.68-4.12)</td>
</tr>
</tbody>
</table>

Richoz et al. Neurology 2015
Avoid stroke chameleons
Think « stroke » if acute appearance of ...

Isolated vertigo

Coma / decreased level of consciousness

Monoparesis

Confusion / amnesia/ behavioural problem
MIMICS AND CHAMELEONS IN OLD AND YOUNG PATIENTS
Age distribution in stroke, mimics and chameleons

«Regular» strokes

Chameleons

Mimics
# Mimics by age: the numbers

<table>
<thead>
<tr>
<th>Age</th>
<th>All standard TIV</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mimics</td>
<td>Strokes</td>
</tr>
<tr>
<td>&lt;50</td>
<td>22</td>
<td>122</td>
</tr>
<tr>
<td>50-80</td>
<td>34</td>
<td>1005</td>
</tr>
<tr>
<td>&gt;80</td>
<td>28</td>
<td>539</td>
</tr>
</tbody>
</table>

- **Missed IVT**
  - <50: 100%
  - 50-80: 10%
  - >80: 0%

- **Pie chart**
  - >80
  - 50-80
  - <50
Chameleons by age: the numbers

<table>
<thead>
<tr>
<th>Age</th>
<th>Chameleons</th>
<th>Strokes</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50</td>
<td>37</td>
<td>539</td>
</tr>
<tr>
<td>50-80</td>
<td>97</td>
<td>3286</td>
</tr>
<tr>
<td>&gt;80</td>
<td>48</td>
<td>1883</td>
</tr>
</tbody>
</table>

All ischemic stroke

![Pie chart showing percentage distribution of ischemic stroke cases by age group]
Lysed mimics over the years

- 2009-10: 2%
- 2011-12: 3%
- 2013-14: 8%
- 2015-16: 6%
- 2017-18: 7%
- 2019-20: 4%
Lysed mimics over the years by age groups

- < 50:
  - 2009-10: 0%
  - 2011-12: 1%
  - 2013-14: 5%
  - 2015-16: 4%
  - 2017-18: 6%
  - 2019-20: 3%

- 50-80:
  - 2009-10: 17%
  - 2011-12: 10%
  - 2013-14: 25%
  - 2015-16: 14%
  - 2017-18: 28%
  - 2019-20: 6%

- > 80:
  - 2009-10: 0%
  - 2011-12: 1%
  - 2013-14: 5%
  - 2015-16: 4%
  - 2017-18: 6%
  - 2019-20: 3%

- Overall:
  - 2009-10: 0%
  - 2011-12: 1%
  - 2013-14: 5%
  - 2015-16: 4%
  - 2017-18: 6%
  - 2019-20: 3%
Mimics diagnosis according to age

- Encephalopathy
- Inflammatory/infectious disease
- Migraine
- Neurovascular not ischemic
- Peripheral deficit
- Psychogenic
Lysed mimics by age groups: MRI effect?
Chameleons over the years

Overall

- 4% in 2009-10
- 3% in 2011-12
- 5% in 2013-14
- 4% in 2015-16
- 3% in 2017-18
- 3% in 2019-20
Chameleons over the years by age groups
Symptoms of stroke chameleons according to age

- No paresis
- Vigilance alteration
- Cognitive deficit
- Isolated aphasia
- Isolated cerebellar syndrome

Age categories:
- <50
- 50-80
- >80
Stroke mimics and chameleons: conclusion

• Suspicion of stroke/TIA: make a differential diagnosis (= keep an open mind)

• Avoid mimics over-treatment
  – Know clinical presentation of mimics (migraine, seizure ...)
  – Careful history, witnesses

• Avoid chameleon strokes and under-treatment
  – Know usual and unusual stroke presentations
  – Think of stroke if vertigo with red flags, sudden unexplained coma, sudden cognitive changes, even in young patient

• Select appropriate imaging, and look at it carefully
Mimics and chameleons in young and old patients

• Stroke mimics: be attentive to →
  – In young: migraine and psychogenic
  – In old: seizures encephalopathies

• Stroke chameleons: be attentive to →
  – In young: absence of paresis, vigilance alterations
  – In old: isolated aphasia, new cognitive deficits
  – In everybody: cerebellar symptoms
MERCI POUR L’ATTENTION!