status epilepticus in children
status epilepticus in children

- convulsive SE
- nonconvulsive SE
- misleading EEG in SE
- epileptic encephalopathies
- febrile SE
- ESES
- epidemiology
- treatment
status epilepticus in children: definition

old: seizure > 30 min or series of seizures with no recovery of consciousness

mean duration GTC seizure: 62 sec.

if seizure duration > 5-10 min: chance of spontaneous termination is very low (<5%)

Theodore et al. Neurology 1994
<table>
<thead>
<tr>
<th>Duration</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 5-10 min</td>
<td>‘early’ / ‘impending’ SE</td>
</tr>
<tr>
<td>&gt; 30 min</td>
<td>‘established SE’</td>
</tr>
<tr>
<td>&gt; 60 min</td>
<td>‘refractory SE’</td>
</tr>
</tbody>
</table>

Lowenstein et al. Epilepsia 1999  
Shorvon et al. Epilepsia 2008  
Meierkord et al. Eur J Neurol 2010  
Brophy et al. Neurocrit Care 2012  
Fernández et al. Seizure 2013
status epilepticus in children: epidemiology

Chin et al. Lancet 2006
status epilepticus in children: epidemiology

convulsive SE >30 min, population based study
17-23/100,000/yr

Chin et al. Lancet 2006

Meierkord et al. Eur J Neurol 2010
# Status Epilepticus in Children: Epidemiology

<table>
<thead>
<tr>
<th>Variable</th>
<th>Incidence Coefficient</th>
<th>p</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMD 2004</td>
<td>1.03</td>
<td>0.007</td>
<td>1.01 – 1.06</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-4</td>
<td>1.00 (reference)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5-7</td>
<td>0.30</td>
<td>&lt;0.0005</td>
<td>0.19 – 0.47</td>
</tr>
<tr>
<td>8-9</td>
<td>0.16</td>
<td>&lt;0.0005</td>
<td>0.08 – 0.32</td>
</tr>
<tr>
<td>10-15</td>
<td>0.06</td>
<td>&lt;0.0005</td>
<td>0.03 – 0.12</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1.00 (reference)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Black</td>
<td>1.22</td>
<td>0.83</td>
<td>0.21 - 7.14</td>
</tr>
<tr>
<td>Asian</td>
<td>6.62</td>
<td>0.002</td>
<td>2.0 – 21.9</td>
</tr>
<tr>
<td>Other</td>
<td>1.37</td>
<td>0.72</td>
<td>0.25 – 7.5</td>
</tr>
<tr>
<td><strong>IMD 2004 * Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IMD 2004* White</td>
<td>1.00 (reference)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IMD 2004* Black</td>
<td>1.00</td>
<td>0.97</td>
<td>0.95 - 1.05</td>
</tr>
<tr>
<td>IMD 2004* Asian</td>
<td>0.97</td>
<td>0.05</td>
<td>0.93 – 1.00</td>
</tr>
<tr>
<td>IMD 2004* Other</td>
<td>1.01</td>
<td>0.71</td>
<td>0.96 – 1.06</td>
</tr>
</tbody>
</table>
status epilepticus in children: epidemiology

convulsive SE >30 min, population based study
17-23/100,000/yr

Chin et al. Lancet 2006

incidence = 189 (95% CI 158-226)/100,000/yr

Sadarangani et al. Lancet Neurol 2007
causes of first-ever childhood SE

Chin et al. Lancet 2006
status epilepticus in children: epidemiology

35% focal onset only
5% remained focal
86% tonic-clonic
60% > 1 hr
17% recurrence (remote symptomatic: 47%)
3.4% case fatality
78% first-ever SE episode
  56% neurologically normal prior to SE

Chin et al. Lancet 2006
status epilepticus in children: treatment

outside hospital

midazolam (nasal, buccal) / diazepam (rectal), repeat once
benzodiazepines: general considerations

$T_{\text{max}}$

- buccal/nasal MDZ < s.l. LZP or rectal DZP

receptor affinity

- MDZ and LZP > DZP

% seizure/SE termination

- rectal LZP > rectal DZP
- buccal/nasal MDZ > rectal DZP
- i.m. MDZ > i.v. LZP
- i.v. LZP = i.v. DZP

time to seizure termination

- i.m. MDZ < i.v. LZP (NS)
- i.m. or nasal MDZ < i.v. DZP
benzodiazepines: general considerations

SE alters GABA and glutaminergic receptor numbers

50% reduction in GABA receptors on neuronal membrane within 1 hour of onset of SE1
- removes the receptors from the reach of benzodiazepines
- potential mechanism for loss of response to benzodiazepines

Glutamate receptor numbers also increase due to their migration to the cell membrane

Naylor et al. J Neurosci 2005
benzodiazepines: general considerations

status epilepticus in children: treatment

outside hospital
midazolam (nasal, buccal) / diazepam (rectal), repeat once

in hospital: general measures
stabilization of vital functions, 100% O₂, i.v. access
check glucose
control hyperthermia
consider consultation intensivist
specific diagnostics by indication (lab, tox-screen, CT, CSF):
    acute symptomatic causes!
status epilepticus in children: treatment

\( t=0 \), step 1
if no i.v.: midazolam i.m./nasal/buccal
once i.v.: midazolam or lorazepam i.v.

\( t=5 \), step 2
repeat step 1

\( t=10 \), step 3
midazolam or lorazepam i.v.

\( t=15 \), step 4
phenytoin i.v. in 20 min. (or LEV or VPA)
refractory SE in children: treatment

definition: failure of initial benzodiazepine and another class of antiepileptic drug

incidence: of 193 children with convulsive SE: 26% > 1 hr mortality up to 32%

Fernández et al. pSERG, Seizure 2013
refractory SE in children: treatment

PICU

(before anesthetic treatment, after PHT: LEV? VPA? PHB?)

- continuous midazolam i.v. (up to 1 mg/kg/hr)
- thiopental? **no controlled studies**
- propofol?
van Gestel et al. Neurology 2006

34 RSE

22 propofol (≥1999)

12 thiopental (<1999)

8 CSE despite propofol

20 thiopental

64% control of SE
9% mortality
16% side effects (rev)

55% control of SE
40% mortality
100% inotropes, fluids
75% pulm infiltrates
‘superrefractory’ SE in children: treatment

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Published cases in controlled or randomized studies (n)</th>
<th>Published cases in open series or as case reports (reports, n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentobarbital/thiopental</td>
<td>9&lt;sup&gt;a&lt;/sup&gt;</td>
<td>377 (32)</td>
</tr>
<tr>
<td>Midazolam</td>
<td>0</td>
<td>661 (29)</td>
</tr>
<tr>
<td>Propofol</td>
<td>14&lt;sup&gt;a&lt;/sup&gt;</td>
<td>183 (34)</td>
</tr>
<tr>
<td>Ketamine</td>
<td>0</td>
<td>17 (8)</td>
</tr>
<tr>
<td>Inhalational anaesthetics</td>
<td>0</td>
<td>32 (11)</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>0</td>
<td>10&lt;sup&gt;c&lt;/sup&gt; (5)</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0</td>
<td>11 (3)</td>
</tr>
<tr>
<td>Pyridoxine</td>
<td>0</td>
<td>14 (5)</td>
</tr>
<tr>
<td>Steroids/immunotherapy</td>
<td>0</td>
<td>50 (15)</td>
</tr>
<tr>
<td>Ketogenic diet</td>
<td>0</td>
<td>20 (6)</td>
</tr>
<tr>
<td>Transcranial magnetic stimulation</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vagal nerve stimulation</td>
<td>0</td>
<td>4 (4)</td>
</tr>
<tr>
<td>Deep brain stimulation</td>
<td>0</td>
<td>1&lt;sup&gt;b&lt;/sup&gt; (1)</td>
</tr>
<tr>
<td>Resective neurosurgery</td>
<td>0</td>
<td>36 (15)</td>
</tr>
<tr>
<td>CSF drainage</td>
<td>0</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Electroconvulsive therapy</td>
<td>0</td>
<td>8 (6)</td>
</tr>
</tbody>
</table>

SE that continues >24 hr after onset of anesthetic Tx

Shorvon and Ferlisi
Brain 2011

Fernández et al. pSERG
Seizure 2013
outcome of convulsive SE in children

systematic review

63 studies

short-term mortality 2.7-5.2%
morbidity other than epilepsy 15%
prognosis primarily determined by underlying cause
? effect of age and duration
? additional effect of CSE

Raspall-Chaure et al. 
Lancet Neurol 2006
status epilepticus in children

convulsive SE

invisible SE

epidemiology

treatment

febrile SE

Brain Center Rudolf Magnus
causes of first-ever childhood SE

Chin et al. Lancet 2006

Proportion of first-ever episodes of convulsive status epilepticus

Subcategories of acute symptomatic convulsive status epilepticus

25-40% = febrile SE

Fernández et al. pSERG, Seizure 2013
febrile SE in children

119 children with febrile SE (>30 min)

- no CNS infection
- no prior afebrile sz
- no severe neurol disability

86% normal prior development
24% prior febrile seizures
25% family history FS (first-degree)

52% continuous SE
67% partial
99% convulsive
median age 1.3 yr, median duration 68 min

Shinnar et al. FEBSTAT, Neurology 2008
febrile SE in children

199 children with febrile SE (>30 min)  
- no CNS infection
- no prior afebrile sz
- no severe neurol disability

90% at least 1 AED
70% 2 or more AEDs

48% required respiratory support

earlier AED initiation: shorter SE duration

Seinfeld et al. FEBSTAT, Epilepsia 2014
febrile SE in children - HHV

169 children with febrile SE (>30 min), HHV 6/7 serum PCR

HHV-6B 32%
HHV-7 7% 2/3 primary, 1/3 reactivation

- no pleocytosis
- CSF PCR –
- no differences in clinical characteristics
- proximate cause of fever or direct viral effect on brain?

Epstein et al. FEBSTAT, Epilepsia 2012
febrile SE in children affects cognitive outcome

Martinos et al. Epilepsia 2013
febrile SE in children

febrile SE – TLE in adult life

2-5% of healthy children < 5 yrs have febrile seizures (FS)

5-10% of febrile seizures: febrile SE

50-80% of patients with refractory TLE and HS had FS
## association febrile SE – hippocampal sclerosis

<table>
<thead>
<tr>
<th>genetic predisposition?</th>
<th>2nd hit epileptogenic event</th>
<th>epileptogenesis latent period (8-11yrs)</th>
<th>TLE HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>febrile seizures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>status epilepticus</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- neuronal loss (GABAergic > glutamatergic)
- gliosis
- mossy fibre sprouting
### febrile SE – hippocampal abnormalities

**MRI <72 hrs following SE**

<table>
<thead>
<tr>
<th>MRI finding</th>
<th>FSE (n = 191, n (%))</th>
<th>Simple FS, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>Definite</td>
</tr>
<tr>
<td>Any abnormality</td>
<td>63 (33.0)</td>
<td>46 (24.1)</td>
</tr>
<tr>
<td>Hippocampal abnormality</td>
<td>40 (20.9)</td>
<td>30 (15.7)</td>
</tr>
<tr>
<td>Abnormal T2 signal</td>
<td>22 (11.5)</td>
<td>17 (8.9)</td>
</tr>
<tr>
<td>Developmental abnormality</td>
<td>20 (10.5)</td>
<td>16 (8.4)</td>
</tr>
<tr>
<td>HIMAL</td>
<td>15 (7.9)</td>
<td>15 (7.9)</td>
</tr>
<tr>
<td>Other</td>
<td>5 (2.6)</td>
<td>0</td>
</tr>
<tr>
<td>Nonhippocampal abnormality</td>
<td>30 (15.7)</td>
<td>22 (11.5)</td>
</tr>
<tr>
<td>Temporal lobe/amygdala</td>
<td>15 (7.9)</td>
<td>8 (4.2)</td>
</tr>
<tr>
<td>Extratemporal</td>
<td>20 (10.5)</td>
<td>16 (8.4)</td>
</tr>
</tbody>
</table>

**p Value**
- Any abnormality: 0.0008
- Hippocampal abnormality: <0.0001
- Abnormal T2 signal: <0.0001
- Developmental abnormality: 0.0097
- HIMAL: 0.06
- Other: 0.17
- Nonhippocampal abnormality:
  - FSE: 1
  - Simple FS: 1
- Temporal lobe/amygdala:
  - FSE: 0.015
  - Simple FS: 0
- Extratemporal:
  - FSE: 0.34
  - Simple FS: 0.34

*Shinnar et al. FEBSTAT, Neurology 2012*
febrile SE – white matter abnormalities

32 children with febrile SE, DTI/TBSS: 1, 6, 12 m
febrile SE – white matter abnormalities

32 children with febrile SE, DTI/TBSS: 1, 6, 12 m

temporary halting of normal white matter development?

Yoong et al. NeuroImage 2013
status epilepticus in children

convulsive SE

invisible SE

nonconvulsive SE ESES
nonconvulsive / electrographic SE in children

“enduring epileptic disorder with altered consciousness, behavioural abnormalities, or merely subjective symptoms, without major convulsive movements”

Abend et al. Lancet Neurol 2013

550 children, 11 US sites, continuous EEG on PICU:

162  29%  electrographic seizures (1/3 EEG only)
61   11%  electrographic SE

continuous > 30 min: 46%
intermittent sz > 30 min/1hr: 51%

Abend et al. Neurol 2013
nonconvulsive SE
electrographic seizures/SE after convulsive SE

98 children with convulsive SE on PICU with subsequent continuous EEG monitoring

32 (33%) electrographic sz
17 (53%) “some” clinical correlate

15 (15%) electrographic SE
continuous 40% intermittent 60%

Fernández et al. J Pediatr 2013
## Outcome after Electrographic sz / SE

<table>
<thead>
<tr>
<th></th>
<th>Elctr sz</th>
<th>Elctr SE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Children on PICU</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=200</td>
<td>21%</td>
<td>22%</td>
</tr>
<tr>
<td>n=550</td>
<td>18%</td>
<td>11%</td>
</tr>
<tr>
<td><strong>Electrographic sz</strong></td>
<td>no influence</td>
<td>OR 2.4 / 5.1</td>
</tr>
<tr>
<td><strong>Electrographic SE</strong></td>
<td>no influence</td>
<td>OR 17.3</td>
</tr>
</tbody>
</table>

Abend et al. Lancet Neurol 2013
adults with partial complex SE
80% hippocampal diffusion abnormalities
31-90% pulvinar diffusion abnormality

Szabo et al. Brain 2005
Katramados et al. Epilepsia 2009
consequences of unrecognized hemi-SE
DWI
Slice: 6 mm
Pos: 57.6
TR: 2573.96
TE: 81
AC: 1

Pos: 79.2
TR: 2573.96
TE: 81
AC: 1
status epilepticus in children

convulsive SE

invisible SE

nonconvulsive SE ESES
electrical status epilepticus in sleep

epileptic encephalopathy, acquired deterioration in:

• cognition
• language
• behavior

accompanied by ESES on EEG, with or without seizures
epilepsy syndromes with ESES

Landau-Kleffner syndrome (LKS)
epileptic encephalopathy with continuous spike-and-waves during slow wave sleep (CSWS)
atypical ‘benign’ focal epilepsy of childhood (ABFEC)
etiology

- structural
- genetic (GRIN2a, ...)
- unknown

inflammation?
ESES

sleep induced epileptiform activity
> 85% non-REM sleep
absence of physiological sleep activity
age 1-14 years, median 4-8 y
impact of epileptic discharges

transient inhibition of brain networks
  functionally inappropriate synaptic cortico-cortical arrangements in a critical period for development of associative cortices

long lasting effects on brain function and plasticity
  interference with the sleep-dependent physiological processes of neuronal plasticity supporting memory consolidation for recently learned information
prognosis

- ESES resolves spontaneously during puberty
- cognitive sequelae often remain

→ early adequate treatment is mandatory
meta-analysis

- 114 papers: cognitive/EEG outcome of ESES
- authors contacted for additional patient data
- 575 patients (282 treated consecutively)

<table>
<thead>
<tr>
<th>treatment</th>
<th>any effect (cognition and/or EEG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEDs</td>
<td>34%</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>59%</td>
</tr>
<tr>
<td>Steroids</td>
<td>75%</td>
</tr>
<tr>
<td>Surgery</td>
<td>93%</td>
</tr>
<tr>
<td>Other</td>
<td>58%</td>
</tr>
<tr>
<td>Total</td>
<td>50%</td>
</tr>
</tbody>
</table>

van den Munckhof, Jansen et al. submitted
meta-analysis

- treatment with steroids and surgery (in suitable candidates) seems most effective
- benzodiazepines are an appropriate alternative
- AED are less effective

- pre-existent developmental delay is related to poorer treatment response

van den Munckhof, Jansen et al. submitted
meta-analysis

however:
• mostly small, retrospective studies
• publication bias
• no quantified outcome measures
• side-effects not included in analysis

a Randomized Controlled Trial is urgently needed!
Randomized European trial of Steroids versus Clobazam Usage for Encephalopathy with ESES
status epilepticus in children

misleading EEG in SE

convulsive SE

invisible SE
Sturge-Weber syndrome

Di Rocco et al. CNS 2006
Sturge-Weber syndrome

neurocutaneous syndrome
port-wine nevi n. V, pial angioma, glaucoma

MR: superficial cortical/meningeal enhancement
enlarged choroid plexus
venous congestion, hydrocephalus
progressive cerebral atrophy
progressive cortical calcifications
early in life: WM low T2 ("advanced myelination")
Sturge-Weber syndrome
Sturge-Weber syndrome L hemisphere
Epilepsia Partialis Continua

“spontaneous regular or irregular clonic muscular twitching affecting a limited part of the body, sometimes aggravated by action or sensory stimuli, occurring for a minimum of one hour, and recurring at intervals of no more than ten seconds”
Rasmussen encefalitis
POLG1 / Alpers
Sturge-Weber
MELAS
FCD
stroke
brain injury
DNKHC
tumor
meningo-encephalitis
CJD
Hashimoto

<table>
<thead>
<tr>
<th>Cause</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>inflammatory</td>
<td>32%</td>
</tr>
<tr>
<td>tumor</td>
<td>19%</td>
</tr>
<tr>
<td>vascular</td>
<td>14%</td>
</tr>
<tr>
<td>traumatic</td>
<td>16%</td>
</tr>
<tr>
<td>other</td>
<td>19%</td>
</tr>
</tbody>
</table>
polymerase gamma mutations, AR (A467T W748S) replication mtDNA

broad phenotype

Alpers syndrome, developmental regression (VPA-induced) hepatic failure occipital epilepsy, refractory SE, EPC, shifting foci ataxia, polyneuropathy, ophthalmoplegia, myoclonus
POLG – Alpers: RHADS

Wolf et al. Epilepsia 2009

A

Fp1-F7  F7-T3  T3-T5  T5-O1  Fp1-F3  F3-C3  C3-P3  P3-O1  Fz-Cz  Cz-Pz  Fp2-F4  F4-C4  C4-P4  P4-O2  Fp2-F8  F8-T4  T4-T6  T6-O2

120µV, 1s to 0.3s
POLG – Alpers: RHADS

McCoy et al. Eur J Ped Neurol 2011
POLG - MRI

Wolf et al. Epilepsia 2009
EPC – EEG invisible

MRI may help!
EPC – normal EEG, SE on iEEG

Lv et al. Clin EEG Neurosci 2013
EPC – normal EEG, SE on iEEG

Lv et al. Clin EEG Neurosci 2013
EPC – normal EEG, SE on iEEG

Lv et al. Clin EEG Neurosci 2013
status epilepticus in children

convulsive SE

epileptic encephalopathies

invisible SE
different shades of grey in SE

“furthermore, what appears to one interpreter as status epilepticus, is not to another reader, reflecting the “art” of EEG interpretation”

“seizures and epilepsy syndromes have undergone an evolution that has moved beyond a classification of focal or generalized conditions into a syndromic approach”

Sutter and Kaplan, Epilepsia 2012
criteria for NCSE in early life

- clear clinical change in behavior (cognition, memory, arousal, ataxia, motor learning/behavior) >30 min

- confirmation (clinical/neuropsych exam)

- (virtually) continuous paroxysmal episodes on EEG

- no continuous major seizures (tonic or clonic)

Sutter and Kaplan, Epilepsia 2012
epileptic encephalopathies in early life

“a condition where the epileptic activity itself may contribute to the severe neurological and cognitive impairment seen in severe epilepsy, over and above that which would be expected from the underlying pathology alone”

Berg et al. ILAE Epilepsia 2010
McTague and Cross, CNS drugs 2013

continous “interictal” epileptiform activity may be reversible
may correlate with neurodevelopmental progress
epileptic encephalopathies in early life - WS

“silent state”

Philippi et al. Epilepsia 2008
epileptic encephalopathies in early life - WS

“mental deterioration” modified hypsarrhythmia

Philippi et al. Epilepsia 2008
epileptic encephalopathies in early life - WS

“severe mental deterioration” hypsarrhythmia

Philippi et al. Epilepsia 2008
criteria for NCSE in early life – West syndrome

- clear clinical change in behavior (cognition, memory, arousal, ataxia, motor learning/behavior), >30 min
- confirmation (clinical/neuropsych exam)
- (virtually) continuous paroxysmal episodes on EEG
- no continuous major seizures (tonic or clonic)

Sutter and Kaplan, Epilepsia 2012
epileptic encephalopathies in early life - LGS
epileptic encephalopathies in early life - LGS
epileptic encephalopathies in early life - LGS
epileptic encephalopathies in early life - LGS

after phenobarbital
epileptic encephalopathies in early life - LGS
epileptic encephalopathies in early life - LGS

after midazolam
epileptic encephalopathies in early life

- Lennox-Gastaut syndrome: non-convulsive (atypical absence) SE is common
  hard to differentiate from interictal EEG patterns
  hard to treat
epileptic encephalopathies in early life

- Lennox-Gastaut syndrome: non-convulsive (atypical absence) SE is common
  hard to differentiate from interictal EEG patterns
  hard to treat

- West syndrome with developmental regression and full hypsarrhythmia; NCSE?
  reversible EEG patterns with treatment
  cognitive improvement
status epilepticus in children - conclusions

diagnosis / treatment
experienced team
child neurologist – neurophysiologist - intensivist

convulsive SE

invisible SE
status epilepticus in children - conclusions

medical emergency
protocolized medicine
(super)refractory; expert opinion

treat underlying cause

febrile SE is frequent but not without risks

convulsive
SE

invisible
SE
status epilepticus in children - conclusions

- Convulsive SE
- Invisible SE

NCSE often follows CSE
NCSE affects outcome
ESES is a threat to cognitive development
Optimal Tx not established
status epilepticus in children - conclusions

EEG may be non-epileptic in SE
Sturge-Weber
EPC
MRI may help
status epilepticus in children - conclusions

epileptic encephalopathies in early life: formes frustes of NCSE? clinical symptoms guide Tx
acknowledgements

Richard Chin
Floor Jansen
Bart van den Munckhof
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