Complications, Failures and Other Unexpected Outcomes Following Epilepsy Surgery: A case of reading epilepsy

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Mitigating Potential Bias

• All honoraria donated to the CHUM Foundation

• No relevance to this presentation
Outline

• Case history
• Presurgical investigations
• Surgery
• Complications
• Learning points
History

• M, 42 y-o, R-H, Bilingual
• Past medical history:
  • A dozen febrile seizures in childhood
  • 3 epileptic siblings
    • A mildly retarded brother with early-onset convulsions who drowned at age 17
    • Another who developed seizures at age 25 (a decade after a head trauma), well controlled on CBZ
    • A sister with non-lesional ill-defined epilepsy since adolescence on CBZ
• Learning difficulties
History

• Inaugural seizure at 23 y-o upon reading a breakup letter:
  • Facial jerks, brief vocalization, sensation of electrical shock, GTCS

• Similar event 6 mo later while reading a driver’s manual

• Subsequently noted ‘minor’ seizures every time he would read something
  • Jaw jerks, vocalization (‘euh’), electric shock
Medical treatment

• Started avoiding reading
• CBZ: no response
• CLB: no response
• LEV: irritability
• TPM: slowing, word-finding diff.
• VPA: marked reduction in facial and body jerks but significant weight gain
Investigations

• 3T-MRI: N
• Video-EEG:
  • No spontaneous discharges
  • L F-C or bi-F-C epileptiform discharges induced by reading tasks
EEG: no spikes at rest
EEG: L/bi F-C spikes induced by reading

EEG: effect of linguistic characteristics on spike frequency

<table>
<thead>
<tr>
<th>Task</th>
<th>Mean spike frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading tasks</td>
<td>15.84</td>
</tr>
<tr>
<td>Verbal tasks</td>
<td>0.91</td>
</tr>
<tr>
<td>Nonverbal tasks</td>
<td>0.17</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Reading pathway</th>
<th>Tasks from Table 2</th>
<th>Mean spike frequency</th>
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</thead>
<tbody>
<tr>
<td>Phonological</td>
<td>2, 4, 5, 7, 11, 12, 17, 21, 22</td>
<td>24.01</td>
</tr>
<tr>
<td>Lexical</td>
<td>1, 3, 6, 8–10, 13, 19, 23</td>
<td>13.92</td>
</tr>
</tbody>
</table>

EEG: effect of linguistic characteristics on spike frequency

EEG: effect of linguistic characteristics on spike frequency

EEG-fNIRS:

fMRI language

DB 12 mars 2008 fluence

DB 12 mars 2008 syntaxe
fMRI: reading
fNIRS: reading

fNIRS: reading

Invasive EEG
IC-EEG: spontaneous focal spikes
IC-EEG: spikes induced by reading
Post-op

- Expected mild to moderate dysarthria, expressive dysphasia and facial paresis largely resolved with speech therapy and time

- No arm motor deficit
Follow-up (4mo)

• Quasi-resolution of dysarthria and word-finding difficulties but now stuttering
• Complex regional pain syndrome (CRPS) affecting the right hand
• Non-epileptic seizures
• New type of seizures: SGTC starting with R head deviation
L-sided seizure
End S
Non-epileptic seizure
Reading
Last follow-up

• Complex regional pain syndrome (CRPS) affecting the right hand partially controlled with PGB
• SGTC eventually controlled with PHT, CLB, BRV
• Mild stuttering
• Separated
CRPS and epilepsy surgery

Epilepsy surgery involving the sensory-motor cortex

Margarita Pondal-Sordo,1 David Diosy,1 José F. Téllez-Zenteno,2,3 John P. Girvin1 and Samuel Wiebe3

• N = 52 patients (1979-2003)
• Median age at surgery: 33 yo
• Etiologies: 50% neoplastic, 15% vascular, 12% MCD, 6% Rasmussen, 17% others
• Surgery in:
  • Pre-central gyrus (n=17)
  • Pre- and post-central gyrus (n=13)
  • Inferior central region (n=11)
  • Post-central gyrus (n=7)
  • Pre-central gyrus and mesial frontal area (n=2)

• Outcome: 31%
  • Engel 1 (31%), Engel 2 (15%), Engel 3 (27%), Engel 4 (27%)
• Complications
  • 26 patients (50%) had a new or more severe post-op neuro deficit
    • 38% with pre-existing deficits
    • New deficits were mild in 14 (54%).
    • Most deficits involved motor function and speech
  • No report of CRPS
CRPS and epilepsy surgery

Epilepsy surgery of the rolandic and immediate perirolandic cortex: Surgical outcome and prognostic factors

*Daniel Delev, *Knut Send, †Jan Wagner, *'Marc von Lehe, ‡D. Ryan Ormond, *Johannes Schramm, and *Alexander Grote

Epilepsia, **(*):1–9. 2014
doi: 10.1111/epi.12747

• N = 66 patients
• Mean age at surgery: 31 (3-70)
• 64% favorable outcome, 34% postop permanent deficit, no CRPS reported
Operculo-insular central pain syndrome

CRPS and craniotomy

Case report

Lower extremity complex regional pain syndrome type II after a craniotomy: case report

Juan B. Firnhaber-Burgos MD (Assistant Professor)*, Priya Gupta MD (Instructor in Anesthesiology)

- L foot drop post-op 2 (peroneal palsy)
- CRPS 4 weeks after surgery
CRPS and seizures

Case Report

Complex Regional Pain Syndrome Revived by Epileptic Seizure Then Disappeared Soon during Treatment with Regional Intravenous Nerve Blockade: A Case Report

Masahiko Sumitani,¹ Arito Yozu,² Toshiya Tomioka,¹ Satoru Miyauchi,³ and Yoshitsugu Yamada¹

• L hand CRPS after aortic valve replacement treated with nerve blockade
• Revived by (probable temporo-parietal) seizures of unclear cause
Post-op 2ary generalization

• Post-op alteration of inhibitory network in rolandic region?

Role of primary sensorimotor cortices in generating inhibitory motor response in humans

Akio Ikeda,1,3 Shinji Ohara,1 Riki Matsumoto,1 Takeharu Kunieda,2 Takashi Nagamine,1 Susumu Miyamoto,2 Nobuo Kohara,3 Waro Taki,2,4 Nobuo Hashimoto2 and Hiroshi Shibasaki1,3

• No mention of increased 2ary generalization in rolandic region epilepsy surgeries in the literature
Post-op 2ary generalization

Increased secondary generalization of partial seizures after temporal lobectomy

Thomas R. Henry, MD; Ivo Drury, MBCh; Lori A. Schuh, MD; and Donald A. Ross, MD

NEUROLOGY 2000;55:1812–1817

N = 60 consecutive ATL (51 unilat)
20/60 w/ ≥ 1 CP or GTC seizures after surgery
Generalization fraction (# of GTCS/# of seizures) greater after surgery
Most GTCS not associated w/ AED withdrawal
PNES after epilepsy surgery

• Gonzalez-Otarula et al. 2017 (MNI)
  • 8/220 (3.6%) de novo PNES (37.5% Engel 1, 62.5% Engel II-IV)
  • No predictors identified
• Asadi-Pooya et al. (2016):
  • 27/1105 (3.9%)
  • Preop psychiatric diagnosis associated with postop PNES
• Markoula et al. (2013):
  • 29/790 (3.7%)
  • Risk factors: female gender, preop psychiatric dx other than psychosis
Learning points

• Probably not a good idea to operate reading epilepsy (n=1)

• In reading epilepsy, hyperexcitable neurons (in P-T-O regions) during reading triggers discharges that secondarily propagate to PMC/SMA/M1 areas to generate jerks

• Motor areas are the symptomatogenic zone related to myolonic jerks and are not the trigger/epileptogenic zones
Learning points

• Epilepsy surgery in circumscribed epileptic networks may (perirolandic, mesial temporal) may lead to 2ary generalization

• CRDS is very rare (unclear if any other conclusion can be drawn)
Learning points

• De novo post-op PNES are found in less than 4% of patients, esp if preop psychiatric disorder
Thank you