Introduction to seizures and epilepsy

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Symptomatic seizures

- Head injury (trauma)
- Stroke
- Infections
- Toxic
- Metabolic
- Fever (babies)
Definitions

- **Epileptic seizure (seizure):** transient neurologic symptoms caused by an abnormal electrical discharge in the brain (~9% of the population)
- **Epilepsy:** recurrent seizures (prevalence ~1%)
- “Seizure disorder:” same as epilepsy
- **Non-epileptic seizure:** resemble epilepsy
International classification of **Seizures**

**Partial (focal)**
- Simple
  - Motor
  - Sensory
  - Autonomic
  - Psychic
- Complex
- PEGTC

**Generalized**
- Tonic
- Clonic
- GTC
- Myoclonic
- Atonic
- Absence
### The different types of epilepsies

<table>
<thead>
<tr>
<th></th>
<th>Generalized</th>
<th>Partial</th>
</tr>
</thead>
</table>
| **Idiopathic (genetic)** | • Childhood absence Ep  
• Juvenile myoclonic Ep  
• Ep with grand-mal on Aw  
• Others | • Benign focal epilepsy of childhood (2 types) |

| **Symptomatic (cause known)** | **Cryptogenic (cause unknown)** | • West syndrome  
• Lennox-Gastaut syndrome  
• Others | • Temporal lobe  
• Frontal lobe  
• Others |
“Routine” EEG

- Only a 20 minute sample
- Normal in over 50% patients with proven epilepsy (poorly “sensitive”)
- Highly specific for epilepsy BUT
- Often mis-interpreted
Ambulatory EEG

- A recent advance
- Home recording for 1-3 days
- Purpose: to record the spells
- The “Holter monitor” of the brain
- Ambulatory EEG-video?
EEG-VIDEO MONITORING

- The only way to be sure !!!
- Recording of the event
  - Clinical characteristics (behavior)
  - Ictal EEG
- Continuous recording
- Safe discontinuation of AEDs
What EEG-video monitoring can do

1. Epileptic vs. non-epileptic events
2. Type of epilepsy
3. If focal (localized), where?

Treatment options
The misdiagnosis of epilepsy

- 20-30% of patients referred for EEG-video
- 25% of patients seen at specialized epilepsy clinics
Overinterpretation of EEGs and Misdiagnosis of Epilepsy

Selim R. Benbadis and William O. Tatum

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The overinterpretation of EEGs is a known problem that has not been reported specifically. The authors report a series of EEGs on patients who were diagnosed eventually with psychogenic nonepileptic seizures and who had an EEG read as epileptiform. Of the 15 actual records available for review, the overread patterns were wicket spikes (n = 1), hypnagogic hypersynchrony (n = 1), and hyperventilation-induced slowing (n = 1). In the other 12 records, the overread patterns were simple fluctuations of sharply contoured background rhythms or fragmented α activity. Rather than well-described normal variants, the overinterpreted patterns tend to be normal fluctuations of background activity. Key Words:
OVER-INTERPRETATION OF EEGs AND MISDIAGNOSIS OF EPILEPSY
Syncope

A costly misdiagnosis
Syncope: a videometric analysis

- Lempert et al, Ann Neurol 1994
- Complete syncope induced in 42 healthy volunteers (HV, squatting, rising, and Valsalva)
- 38 of 42 episodes (90%) had myoclonic activity (multifocal, focal or generalized)
Syncope

... is more often “convulsie” than limp
Psychogenic non-epileptic seizures

“When the heart suffers, the body cries out…”
EPIDEMIOLOGY

- 20-30% of refractory patients
- Prevalence around 30 per 100,000 (~MS)
- Incidence around 4 per 100,000
- Female predominance (in adults)
- Age:
  - Usually young adult
  - But reported from age 7 to 77
What % of PNES patients have epilepsy?

- **MYTH**: Many (30-60%) of patients with pseudoseizures also have epilepsy [old studies or statements without data]

How many patients with psychogenic nonepileptic seizures also have epilepsy?

**Article abstract**—The proportion of patients with psychogenic nonepileptic seizures (PNES) who also have epilepsy has been reported to vary from 10% to over 50%. The authors reviewed all 32 patients diagnosed with PNES in our EEG-video monitoring unit over a period of 1 year, and only 3 (9.4%) had interictal epileptiform discharges to support a coexisting diagnosis of epilepsy. Thus, the authors believe that only a small proportion of patients with PNES have coexisting epilepsy.

SELIM R. BENBADIS, MD; VIKAS AGRAWAL, MD; AND WILLIAM O. TAMUM, IV, DO

Psychogenic nonepileptic seizures (PNES) are commonly seen at epilepsy centers, where they represent approximately 20% of patients referred for refractory seizures. They are probably quite common in the general population, with an estimated prevalence of 2 to 33 per 100,000, making this problem nearly as common as MS and trigeminal neuralgia. One issue of considerable importance in clinical practice is the proportion of patients with PNES who also have epilepsy. This has been reported to vary from 10% to over 50%. It is of extreme importance for management of PNES to consider the possibility of an underlying seizure disorder. In our study, 3 of 32 patients (9.4%) had interictal epileptiform discharges to support a coexisting diagnosis of epilepsy. Evidence for epilepsy was defined as unequivocal epileptiform discharges, focal or generalized, including sharp waves or spikes, spike-wave complexes, polyspikes, or any ictal pattern, as determined by one reader (not necessarily both). Well-accepted and unequivocal criteria for those epileptiform discharges were used, and transients that met criteria for benign variants were not considered epileptiform.
CLINICAL MANIFESTATIONS

• *Can mimic any seizure type*
• Motor (most common)
  • GTC (grand-mal), myoclonic, focal
• Staring & unresponsiveness
  • Absence, complex partial seizure
• Subjective: Aura, simple partial seizure
Seizures vs. pseudoseizures?

- IN FAVOR OF SEIZURES -

- Very stereotyped
- Duration < 2 min
- Eyes open
- Incontinence
- Occurrence out of sleep
- Injury (including tongue biting)
Tongue biting

Specificity ~ 100%

Benbadis et al, *Arch Neurol* 1995
SEIZURE vs. PSEUDOSEIZURE
- History that suggests PNES -

- Precipitants
  - Odd triggers (e.g., pain, noises, getting upset, position)
  - Doctor’s office (75% predictive value)
- High frequency completely unaffected by AEDs
- Associated psychiatric disease
- Florid review of system (somatization)
- Demeanor and social history
- “Fibromyalgia” (75% predictive value) and other vague diagnoses (chronic pain, IBS)
Brief Communication

A spell in the epilepsy clinic and a history of “chronic pain” or “fibromyalgia” independently predict a diagnosis of psychogenic seizures

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Abstract

The clinical suspicion for psychogenic nonepileptic seizures (PNES) is based on multiple features obtained in the history. We reviewed the records of all patients evaluated over 5 years in a single epilepsy clinic for refractory seizures who eventually underwent EEG/video monitoring. We designated two groups: (1) patients with a diagnosis of “fibromyalgia” or “chronic pain” and (2) patients who had a seizure during the visit, either in the waiting area or in the examining room. Of 36 patients with “fibromyalgia” or “chronic pain,” 27 (75%) were found to have PNES. Of 13 patients who had a “seizure” during their clinic visit, 10 (75%) were found to have PNES. We conclude that each of these findings has a predictive value of 75%.

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Hypergraphia and the diagnosis of psychogenic attacks

Selim R. Benbadis, MD, Tampa, FL

A 40-year-old woman was seen for a 2-year history of unusual spills of imp loss of consciousness without abnormal movements, lasting 2 to 10 minutes. There was no warning, no incontinence, and no injury. The frequency was three to four times a week. Neurologic examination was normal. Past medical history and review of systems (Figure), among other features, suggested a diagnosis of psychogenic episodes, which was confirmed by EEG-video monitoring. Such hypergraphia is a helpful sign where both amount and content (fashionable diagnoses) are important, and it may be specific for somatization, though it may be associated with temporal lobe dysfunction.

Disclosures: The author reports no conflicts of interest.

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1. Benbadis SE. The problem of psychogenic symptoms: is the psychiatric community n denial? Epilepsy Behav 2006;9:3-14.

Figure. Past medical history and review of systems as written and provided by the patient. This type of florid list (hypergraphia) suggests somatization and predicts a diagnosis of psychogenic nonepileptic episodes.
SEIZURE vs. PSEUDOSEIZURE
- Ictal phenomena that suggest PNES -

- Characteristics of the jerking or shaking
  - Slow onset & interrupted (stop-and-go)
  - Arrhythmic & asynchronous

- Specific behaviors
  - Pelvic thrusting
  - Head shaking
  - Weeping, stuttering, eyes closed
  - Opisthotonic posturing (“back arching”)
  - Bilateral motor activity *with preserved awareness*
“INDUCTION”

- Purposes:
  - Proves suggestibility
  - Makes evaluation diagnostic if no spells occur
- Various methods: IV saline, patch etc.
- Has to trigger the *habitual* episode
- Sensitivity: 30% and variable
- Specificity: 99%
- Ethical concerns?
Positive diagnosis

- Recording of the habitual episode

PLUS

- Absence of ictal EEG seizure pattern
- And episode is clinically not suggestive of a seizure

EQUALS

- The recorded episode is non epileptic in nature
Psychogenic Seizures and Other Nonepileptic Paroxysmal Events in Children

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Non-epileptic non-psychogenic paroxysmal events

- Breath-holding spells
- Tics, spasmus nutans, shudder attacks, Sandifer’s
- Mannerisms
- Infantile masturbation
- Parasomnias
- Non-epileptic staring spells
EPILEPSY: TREATMENT

- Medications
- Ketogenic diet
- Vagus nerve stimulation
- Surgery
Antiepileptic Drugs
Old drugs

- Phenobarb (1912)
- Phenytoin
- Primidone
- Ethosuximide
- Benzodiazepines
- Carbamazepine
- Valproic acid (1978)
NEWER DRUGS

- Felbamate (1993)
- Gabapentin (1993)
- Lamotrigine (1994)
- Topiramate (1997)
- Tiagabine (1998)
- Levetiracetam (1999)
- Oxcarb (2000)
- Zonisamide (2000)
- Pregabalin (2005)**
New drugs: general features

- In clinical trials, 25-40% ↓ in seizure frequency
- Less sedative
- Better side effect profile
- Still have the typical, common, benign, predictable and dose related side effects
- Positive side-effects
Putting it all together: How to choose

- Efficacy
- Cost
- Pregnancy
- FDA indications
  - Monotherapy
  - Pediatrics
- Pharmacology
  - Metabolism
  - Prot binding
  - Liver induction
  - Drug interactions
- Titration
- Dosing
- Broad spectrum
- Lateral effects/off label use
- Tolerability
  - Type I AE
  - Type II (unique) AE
  - Idiosyncratic AE
- “Exposure”
- Duration of 30 minutes. Nooooo! 5min.
- “Epileptic seizure so frequently repeated or so prolonged that it creates a fixed condition.”
- 2 seizures without recovering baseline consciousness.
Investigational treatments for status

- Midazolam**
- Propofol
  - load: 1-3mg/kg in boluses
  - infusion 1-10 mg/kg/hr
- Valproate
  - rapid IV infusion
  - IV boluses
Treatment of Refractory Status Epilepticus with Propofol: Clinical and Pharmacokinetic Findings


Departments of Neurology and *Anesthesia, Hospital of the University of Pennsylvania; and *Department of Pharmacy Practice and Pharmacy Administration, Philadelphia College of Pharmacy and Science, Philadelphia, Pennsylvania. t: S A

Summary: Purpose: We compared propofol with high-dose barbiturates in the treatment of refractory status epilepticus (RSE) and propose a protocol for the administration of propofol in RSE in adults, correlating propofol’s effect with plasma levels.

Methods: Sixteen patients with RSE were included; 8 were treated primarily with high-dose barbiturates and 8 were treated primarily with propofol.

Results: Both groups of patients had multiple medical problems and a subsequent high mortality. A smaller but not statistically significant fraction of patients had their seizures controlled with propofol (63%) than with high-dose barbiturate therapy (82%). The time to initiation of high-dose barbiturate therapy to attainment of control of RSE was longer (123 min) than the time to attainment of seizure control in the group receiving propofol (2.6 min, p = 0.007). Plasma concentrations of propofol associated with control of SE were 14 μM ± 4 (° 5 μg/mL). Recurrent seizures were common when propofol infusions were suddenly discontinued but not when the infusions were gradually tapered.

Conclusions: If used appropriately, propofol infusions are effective and quickly terminate many but not all episodes of RSE. Propofol is a promising agent for use in treating RSE. Further studies are required to determine its true value in comparison with other agents. Key Words: Status epilepticus—Propofol—Seizures—Barbiturates—Treatment.
THE ROLE OF EPILEPSY CENTERS

- 70% of patients are “controlled” with meds
- About 30% are not !!
- 30% of 1% = 0.3% (MS ~ 0.05%)
- There are more people with uncontrolled epilepsy than with MS!
THE ROLE OF EPILEPSY CENTERS

- “70% of patients are *controlled* on AEDs”
- 30% of patients are intractable
Treatment with AEDs

- Seizure control vs. side effects:
  - Drowsiness
  - Fatigue
  - Poor concentration
  - Dizziness
- **Acceptable vs. unacceptable** side effects ("AED can stop seizures in everyone")
- 30% of epilepsies are intractable
Medication failure

Persistent seizures despite “appropriate” trials of antiepileptic medications

OR

Seizure control at the expense of intolerable side effects
Intractability: when?

- Used to be controversial
- Old definitions:
  - Failure of “maximum medications”
  - One monotherapy plus 1 adjunctive AED
- Other factors:
  - Duration 1-2 years (not “last resort”)
  - Severity: Nature & frequency
How many drugs?

Success of 2nd AED after first AED failed

- Gilman, *Neurology* 1994;44:1341: 5-10%

- 13% benefit with 2<sup>nd</sup>
- 17% with 3<sup>rd</sup>
- Included some “new” drugs (x TPM and later)
- Probability of control after 2 failures = 9.6%
Success with sequential AEDs

Previously Untreated Patients (N=470)

Seizure-free monotherapy 1st AED
47%

Seizure-free monotherapy 2nd AED
13%

Seizure-free monotherapy 3rd AED
1%

Seizure-free polytherapy
3%

Not seizure-free
All regimens attempted
36%

Intractability over time

N drugs

Y % controlled
How many drugs?

- If first drug fails, chances of subsequent control are clearly < 20%

- When 2 drugs fail, the chances of success with subsequent medication trials are < 10%
Non-pharmacologic treatment

- Ketogenic diet
- Vagus nerve stimulation
- Surgery
Ketogenic diet - Indications

- Intractable symptomatic generalized epilepsy of the Lennox-Gastaut type
- Seizure types: atonic, tonic, atypical absences, GTC
- Support system & family
Ketogenic diet - Efficacy

- Effective in 30-50% of children
- Response may be dramatic: 50% reduction to seizure-freedom
- Effect seen within 2-3 weeks
- Main limitation is compliance
The ketogenic diet in adults
(Sirven J, et al., *Epilepsia* 1999;40:1721)

- The ketogenic diet shows promise in adults, for both generalized and partial epilepsy.
- Persistent ketosis is possible in adults, and the diet can be tolerated.
Efficacy of the Atkins diet as therapy for intractable epilepsy

Eric H. Kossoff, MD; Gregory L. Krauss, MD; Jane R. McGrogan, RD; and John M. Freeman, MD

Abstract—The ketogenic diet is effective for treating seizures in children with epilepsy. The Atkins diet can also induce a ketotic state, but has fewer protein and caloric restrictions, and has been used safely by millions of people worldwide for weight reduction. Six patients, aged 7 to 52 years, were started on the Atkins diet for the treatment of intractable focal and multifocal epilepsy. Five patients maintained moderate to large ketosis for periods of 6 weeks to 24 months; three patients had seizure reduction and were able to reduce antiepileptic medications. This provides preliminary evidence that the Atkins diet may have a role as therapy for patients with medically resistant epilepsy.

NEUROLOGY 2003;61:1789–1791
A Modified Atkins Diet Is Effective for the Treatment of Intractable Pediatric Epilepsy

Eric H. Kossoff, Jane R. McGrogan, Renee M. Bluml, Diana J. Pillas, James E. Rubenstein, and Eileen P. Vining

The John M. Freeman Pediatric Epilepsy Center, Departments of Neurology and Pediatrics, The Johns Hopkins Medical Institutions, Baltimore, Maryland, U.S.A.

Summary: Purpose: The Atkins diet may induce ketosis as does the ketogenic diet, without restrictions on calories, fluids, protein, or need for an inpatient fast and admission. Our objective was to evaluate the efficacy and tolerability of a modified Atkins diet for intractable childhood epilepsy.

Methods: Twenty children were treated prospectively in a hospital-based ambulatory clinic from September 2003 to May 2005. Children aged 3–18 years, with at least three seizures per week, who had been treated with at least two anticonvulsants, were enrolled and received the diet over a 6-month period. Carbohydrates were initially limited to 10 g/day, and fats were encouraged. Parents measured urinary ketones semiweekly and recorded seizures daily. All children received vitamin and calcium supplementation.

Results: In all children, at least moderate urinary ketosis developed within 4 days (mean, 1.9). Sixteen (80%) completed the 6-month study; 14 chose to remain on the diet afterward. At 6 months, 13 (65%) had >50% improvement, and seven (35%) had >90% improvement (four were seizure free). Mean seizure frequency after 6 months was 40 per week (p = 0.005). Over a 6-month period, mean serum blood urea nitrogen increased from 12 to 17 mg/dl (p = 0.01); creatinine was unchanged. Cholesterol increased from 192 to 221 mg/dl (p = 0.06). Weight did not change significantly (34.0–33.7 kg); only six children lost weight. A stable body mass index over time correlated with >90% improvement (p = 0.004).

Conclusions: A modified Atkins diet is an effective and well-tolerated therapy for intractable pediatric epilepsy. Key Words: Atkins diet—Ketogenic diet—Epilepsy—Children.
Vagus Nerve Stimulation
Efficacy

Mean % Reduction in Seizures

Study E03 (N=114)
- NCP: 24.5
- Control: 6.1

Study E05 (N=196)
- NCP: 27.9
- Control: 15.2

(NCP Physician’s Manual)
Unlike AEDs

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<tr>
<th>Potential Side Effects</th>
<th>Drugs</th>
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<td>Depression</td>
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<tr>
<td>Fatigue</td>
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<tr>
<td>Dizziness</td>
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<td>NO</td>
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<tr>
<td>Confusion</td>
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<td>NO</td>
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<tr>
<td>Cognitive Impairment</td>
<td>YES</td>
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</tr>
<tr>
<td>Weight Gain</td>
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<tr>
<td>Sexual Dysfunction</td>
<td>YES</td>
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</table>
VNS: general consensus

VNS should *always* be preceded by EEG-video monitoring.
The Timing of Surgical Intervention for Mesial Temporal Lobe Epilepsy

Jerome Engel, Jr, MD, PhD

Surgery for epilepsy is underutilized
THE PROBLEM

- Prevalence 1% and 20-30% intractable
- More patients with intractable epilepsy than patients with MS!!!!!!!
- Patients are not referred or referred too late (average ~ 18 years)
- Misconceptions about epilepsy surgery
A RANDOMIZED, CONTROLLED TRIAL OF SURGERY FOR TEMPORAL-LOBE EPILEPSY

SAMUEL WIEBE, M.D., WARREN T. BLUME, M.D., JOHN P. GIRVIN, M.D., PH.D., AND MICHAEL ELIASZIW, PH.D., FOR THE EFFECTIVENESS AND EFFICIENCY OF SURGERY FOR TEMPORAL LOBE EPILEPSY STUDY GROUP*

ABSTRACT

Background  Randomized trials of surgery for epilepsy have not been conducted, because of the difficulties involved in designing and implementing feasible studies. The lack of data supporting the therapeutic usefulness of surgery precludes making strong recommendations for patients with epilepsy. We conducted a randomized, controlled trial to assess the efficacy and safety of surgery for temporal-lobe epilepsy.

METHODS: Eighty-two patients with drug-resistant temporal-lobe epilepsy were randomized to surgery or continued medical therapy. The surgical group underwent surgery in a 2:1 ratio of lateral to anterior temporal lobectomy. The medical group received the same antiepileptic drugs after a baseline 1-year period. Outcomes were measured with the Engel classification system, the Wechsler Adult Intelligence Scale-Revised, and the Beck Depression Inventory. Results were assessed at 1, 2, and 5 years. The study was stopped at 5 years because the surgical group achieved a higher proportion of Engel class I outcomes at 1 year (67% vs 33%, P < 0.001).

RESULTS: The surgical group showed a more rapid improvement in seizure frequency (P = 0.003) and cognitive function (P = 0.03), and a lower proportion of seizure-related injuries (P = 0.03). The medical group showed a more rapid improvement in depression scores (P = 0.008). There was no significant difference in quality-of-life scores between the groups.

CONCLUSIONS: Surgery for temporal-lobe epilepsy is effective and safe, and should be considered for patients with drug-resistant seizures. Further research is needed to determine the optimal surgical technique and the role of postoperative rehabilitation.

EPILEPSY, a serious health problem that affects people of all ages, races, and socioeconomic backgrounds, has a prevalence of 5 to 10 per 1000 population in North America.¹ ² Epilepsy is the second most common cause of mental health disability, particularly among young adults,³ and accounts for a worldwide burden of illness similar to that of breast cancer in women and lung cancer in men.⁴
CONVERGENCE

Clinical data

EEG

MRI

PET SPECT

Wada

Neuro-psychology

FOCUS
TYPES OF SURGERY

- Cortical resections:
  - Temporal
  - Extratemporal
- Corpus callosotomoy
- Hemispherectomy
> 90% chance of cure with temporal lobectomy !!!!!!!
<table>
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EPILEPSY SURGERY (YEAR 2004)
SEIZURE OUTCOME

Total surgeries (54)
- Class I: Seizure free: 42 (81%)
- Class II: Almost seizure free: 5
- Class III: Somewhat improved: 1
- Class IV: Not improved: 3
- Worse: 0
EPILEPSY SURGERY COMPLICATIONS (YEAR 2004)

NONE
Initial outcomes in the Multicenter Study of Epilepsy Surgery

S.S. Spencer, MD; A.T. Berg, PhD; B.G. Vickrey, MD; M.R. Sperling, MD; C.W. Bazil, MD, PhD; S. Shinnar, MD, PhD; J.T. Langfitt, PhD; T.S. Walczak, MD; S.V. Pacia, MD; N. Ebrahimi, PhD; and D. Frobish, MS, for The Multicenter Study of Epilepsy Surgery

Abstract—Objective: To obtain prospective data regarding seizures, anxiety, depression, and quality of life (QOL) outcomes after resective epilepsy surgery. Methods: The authors characterized resective epilepsy surgery patients prospectively at yearly intervals for seizure outcome, QOL, anxiety, and depression, using standardized instruments and patient interviews. Results: Of 396 patients who underwent resective surgical procedures, 355 were followed for at least 1 year. Of these, 75% achieved a 1-year remission at some time during follow-up; patients with medial temporal (77%) were more likely than neocortical resections (56%) to achieve remission (p = 0.01). Relapse occurred in 59 (22%) patients who remitted, more often in medial temporal (24%) than neocortical (4%) resected patients (p = 0.02). QOL, anxiety, and depression all improved dramatically within 3 months after surgery (p < 0.0001), with no significant difference based on seizure outcome. After 3 months, QOL in seizure-free patients further improved gradually, and patients with seizures showed gradual declines. By 12 and 24 months, overall QOL and its epilepsy-targeted and physical health domains were significantly different in the two outcome groups. (Anxiety and depression scores also gradually diverged, with improvements in seizure-free and declines in continued seizure groups, but differences were not significant.) Conclusion: Resective surgery for treatment of epilepsy significantly reduces seizures, most strikingly after medial temporal resection (77% 1 year remission) compared to neocortical resection (56% 1 year remission). Resective epilepsy surgery has a gradual but lasting effect on QOL, but minimal effects on anxiety and depression. Longer follow-up will be essential to determine ultimate seizure, QOL, and psychiatric outcomes of epilepsy surgery.

NEUROLOGY 2003;61:1680–1685
Risks of surgery?

- Risk of seizures
  - Injuries
  - Death (SUDEP)
- More chances of dying of a seizure than dying of surgery!!!
Epilepsy surgery: the message

- Is a well-established treatment
- Is standard of care
- Is very effective
- Is safe
- Is the victim of many misconceptions
- Is underutilized
Views & Reviews

When drugs don’t work

An algorithmic approach to medically intractable epilepsy

Selim R. Benbadis, MD; William O. Tatum, IV, DO; and Fernando L. Vale, MD

Article abstract—Nonpharmacologic options for the treatment of epilepsy include epilepsy surgery, vagus nerve stimulation, and the ketogenic diet. The advantages and limitations of these treatment modalities have been extensively reviewed, but there is no general consensus on when each option should be considered. The authors propose an algorithm based on the type of epilepsy. Generally, nonpharmacologic options should be considered early—i.e., after the first few drug failures. Because of their good outcome with resective surgery, mesial temporal and lesional neocortical epilepsies should be considered for resection. Conversely, nonlesional neocortical epilepsies are probably best approached with vagus nerve stimulation first. For symptomatic or cryptogenic generalized epilepsies, which are commonly intractable, vagus nerve stimulation and the ketogenic diet appear to be reasonable options to consider before palliative surgery such as corpus callosotomy. Idiopathic (i.e., genetic) generalized epilepsies are only rarely refractory to medications and can be outgrown. In rare cases, vagus nerve stimulation may occasionally play a role in their treatment.

NEUROLOGY 2000;55:1780–1784

Nonpharmacologic options for the treatment of epilepsy include epilepsy surgery, vagus nerve stimulation (VNS), and the ketogenic diet. Whereas the advantages and limitations of these treatment modalities have been extensively reviewed, there is no localization-related epilepsy systematically tested with monotherapy using carbamazepine, phenytoin, phenobarbital, or primidone, only 9.5% achieved success (80% seizure reduction with improved quality of life). Another study reached a similar conclusion in
Practice parameter: Temporal lobe and localized neocortical resections for epilepsy

Report of the Quality Standards Subcommittee of the American Academy of Neurology, in Association with the American Epilepsy Society and the American Association of Neurological Surgeons

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Abstract—Objectives/Methods: To examine evidence for effectiveness of anteromesial temporal lobe and localized neocortical resections for disabling complex partial seizures by systematic review and analysis of the literature since 1990. Results: One intention-to-treat Class I randomized, controlled trial of surgery for mesial temporal lobe epilepsy found that 58% of patients randomized to be evaluated for surgical therapy (64% of those who received surgery) were free of disabling seizures and 10 to 15% were unimproved at the end of 1 year, compared with 8% free of disabling seizures in the group randomized to continued medical therapy. There was a significant improvement in quantitative quality-of-life scores and a trend toward better social function at the end of 1 year for patients in the surgical group, no surgical mortality, and infrequent morbidity. Twenty-four Class IV series of temporal lobe resections yielded essentially identical results. There are similar Class IV results for localized neocortical resections; no Class I or II studies are available. Conclusions: A single Class I study and 24 Class IV studies indicate that the benefits of anteromesial temporal lobe resection for disabling complex partial seizures is greater than continued treatment with antiepileptic drugs, and the risks are at least comparable. For patients who are compromised by such seizures, referral to an epilepsy surgery center should be strongly considered. Further studies are needed to determine if neocortical seizures benefit from surgery, and whether early surgical intervention should be the treatment of choice for certain surgically remeidable epileptic syndromes.

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Pregnancy

- Over 90% of women with epilepsy deliver normal babies
- Risk factors:
  - Polypharmacy
  - Family history of birth defects
  - Poor prenatal care
- All classic agents are overall comparable
- VPA & CBZ: higher incidence of NTD (1-2%)
- Folic acid ~ 4 mg/day
CONCLUSIONS

- The misdiagnosis of epilepsy is not rare
- Many new medications available
- But ~30% of patients are intractable
- Intractability declares itself early
- For the 30% that are not
  - Ketogenic diet
  - Vagus nerve stimulation
  - Surgery: safe & effective, but under-utilized