UNDERSTANDING SEIZURES

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• To the patients, families and friends, I say thank you for your time today

• Today is about advocating for yourself and your loved one

• A chance to think about options, risks and benefits

• To gain a better understanding about why things are done

To meet others who share common concerns
Take Home Points

- Brain tumors are uncommon but seizures are common
- The AAN does not advocate AED prophylaxis
- Not everything that shakes is a seizure
- There are many AED drugs available that allow you to tailor the medications best for you
- Sz precautions should be discussed with your doctor including driving
- Many patients will still have sz on the first medication- explore the options including surgery
- Take your medication as rx and talk to your physician about any concerns
- AED use and risk of suicidality
Disclosures

• Consultant: UCB

• Investigational drugs will be discussed

• Off-label use of drugs will be discussed
I would like to thank Kathy Lupica and Barb Savage - I hope you have a chance to drop around and see our booth and learn a little more about what we can offer.

The Rose Ella Burkhardt Neuro-oncology Center at the Cleveland Clinic- multidisciplinary group of specialists

Thanks to the ABTA for what you do everyday.
Seizure Types

• Generalized (entire brain) or partial (focal) (part of brain)
• Simple (no alteration of consciousness) or complex (alteration of consciousness)
• Partial sz may generalize
• Events are usually stereotypical (the same) and recurrent

Area of the brain defines the type of symptom
Seizure Type

- Not everything that shakes is a seizure
- Syncope, twitches, pseudoseizures
- Hx provides the best answer for most patients w/o the need for EEGs
- EEG can be helpful when questions about “events” are raised
SEIZURES OVERALL IMPACT

• Seizures affect Quality of Life
  • Increased morbidity
  • Decreased independence
  • Depression
  • Anxiety
  • Affects ADL’s i.e. driving, employment, recreation and creates social isolation

Plus they have a TUMOR
SEIZURES & BRAIN TUMORS

• Leads to early diagnosis
• Helps determine location of tumor
• Gray matter more than white matter
• Supratentorial: Parietal, temporal, frontal
• Close to central sulcus
• Rare in infratentorial tumors
LOCATION OF CENTRAL SULCUS
LOCALIZING SEIZURES

Areas of the brain from which partial focal seizures arise:

- **Motor SENSORY**
  - Leg
  - Arm
  - Hand
  - Tongue
  - Mouth
  - Speech

- **Olfactory Hallucinations** (smell)
  - Auditory Hallucinations (hearing)

- **Seizures Involving Speech**
  - Salivation

- **Olfactory Hallucinations** (smell)
  - Auditory Hallucinations (hearing)

- **Automatisms**
  - Forced Thinking
  - Head and Body Turning
  - Tonic Postural Movement

- **Gastrointestinal Sensations**
  - Distortion of Body Image

- **Visual Hallucinations** (seeing)

- **Automatisms (psychomotor seizures)**
Case Example

- 36 y/o RHM to OPD for tx options
- May 06 problems expressing himself
- June/July inappropriate behavior
- MVA 7 12 2006 (probable complex partial seizure (CPS))
- Next wk R hand tingling, expressive problems
- CT/MRI LF mass
- s/p STR 7 17 2006
- Pathology: anaplastic astrocytoma
- Steroids DC 3 days post op
- On PHT for probable sz
CT Brain w/o preop

Large LF mass
L-R shift
Vasogenic edema
Compression LF horn
AEDs: phenytoin

- #1 Rx AED in US
- Generic vs brand name dosing
- Understand the kinetics MM- nonlinear
- Monitor free vs bound
- Comfort and IV formulation
Phenytoin

- 1998 FDA approved generic PHT capsule (Parke-Davis)
- State Minnesota: B to G switch w/o physician notification
- 8 patients w increased sz after conversion to generic PHT
- Mean reduction of 13% in bioavailability to brand name
  - xPHT brand name: 17.7mg/L vs 12.5mg/L w generic

Burkhardt et al Lower phenytoin serum levels in persons switched from brand to generic phenytoin. Neurology 2004;63:1494-1496
Dexamethasone, a synthetic adrenocortical steroid, is a white to practically white, odorless, crystalline powder.

- Cortisone, 25
- Hydrocortisone, 20
- Prednisolone, 5
- Prednisone, 5
- Dexamethasone, 0.75
- Methylprednisolone, 4
Steroids- dex 4mg Q 6 stamp

• French in the early 1960s chose dexamethasone at 16mg a day (4mg Q 6 hours)

• Dex: potent anti-inflammatory w low mineralocorticoid activity

There are no randomized controlled trials looking at steroid use in brain tumors
Steroid Interactions

- Decadron is a CYP3A4 inducer—meaning it affects how drugs are broken down in the liver (i.e.: could affect other drugs that you take—like your seizure medication)
Steroids

- Recommend H2 blocker
- AM loading
- Constant re-evaluation
Seizures and Brain Tumors

• ~200,000 Metastases dx per year

• ~60,000 Primary tumors dx per year

• ~20-40% seizure prior to or after initial dx (depends on tumor type and grade and risk could be 80% or more)

Should everyone go on antiseizure medication?
Practice Parameter from the AAN


Prophylactic AEDs

- There is little argument about using AEDs once a seizure has occurred and future seizures are predictable.

- Our focus here is on prevention of the first seizure.
Prophylactic AEDs

• **Why prevent an initial seizure?:**
  - it may occur at a time during the course of the disease process when it will constitute a severe hazard to the patient
  - permanent structural changes forming an epileptic focus may result from repetitive stimulation (**kindling**), preventing early seizures may reduce the risk of establishing a seizure focus
Prophylactic AEDs

• Should newly diagnosed brain tumors be treated with prophylactic AEDs?
Prophylactic AEDs

- It has been reported that seizure frequency is inversely related to the degree of malignancy
  - oligodendrogliomas 81%
  - astrocytomas 66%
  - ependymomas 50%
  - GBM 42%

AED SE

- Ineffective chemotherapy may be secondary to subtherapeutic drug concn.

Drug delivery to the CNS
How much drug gets there?

Enzyme Inducing Antiseizure Drugs and the Hepatic P450 System

Rx po or iv

Liver

Blood Brain Barrier

Rx reaching brain tumor

Courtesy Skip Grossman
How much drug gets there?

Enzyme Inducing Antiseizure Drugs and the Hepatic P450 System

Liver

Blood Brain Barrier

Rx reaching brain tumor

Rx po or iv
Drug metabolism

- Major route: liver
- Many meds affect the metabolism of chemotherapy drugs by the liver
  - Faster – i.e., meds that induce liver enzymes. Example: phenytoin (Dilantin™)
  - Slower – valproic acid (Depakote™); large quantities of grapefruit juice
  - Not at all – levatirectam (Keppra™)

Anticonvulsants can have major impact on chemotherapy metabolism
Enzyme Inducing Antiseizure Drugs and the Hepatic P450 System

How much drug gets there?

Liver

Blood Brain Barrier

Rx reaching brain tumor

Rx po or iv

Courtesy Skip Grossman
Blood-brain barrier

- Protects brain from toxins
- Selection of drugs – they need to get there
  - lipid soluble
    - BCNU, CCNU
  - small molecules
    - cisplatin
    - hydroxyurea
    - procarbazine
    - temozolomide
- Other issues
  - Protein binding
  - Efflux pumps
  - Tumor interstitial pressure

Paclitaxel

- Prototype taxane
- Inhibits tubular assembly
- Inhibits glioma cells in culture
- Used to treat systemic malignancies
- NABTT trial of preirradiation paclitaxel
- Phase II dose 140mg/m² in 10 GBM patients
- 96 hour continuous infusion
- No CR/PR

No hematologic or nonhematologic toxicity

140mg/m² dose was the MTD for systemic malignancies

Paclitaxel

• Steady-state concentrations were 30% lower than same dose used for systemic cancer
• All patients were on phenytoin- cyt-P450 inducer
• Paclitaxel metabolized by cyt-P450

Revised Phase I dose escalation trial
Paclitaxel

- Phase I: determine MTD for patients on paclitaxel for EIAED and NEIAED
- Phase II for activity at MTD in GBMs
- MTD NEIARD was 140mg/m²
- MTD1 PR only

Prob not effective drug for PBT but have to do trials correctly
Irinotecan (CPT-11)

- Topoisomerase inhibitor
- Approved for tx colorectal cancer - also used for some brain tumors
- Recommended dose 125mg/m\(^2\) 90 min infusion q 4-6 wks
- DLT: diarrhea
- Phase I trial in recurrent glioma
  - MTD EIAED gp 411mg/m\(^2\)
  - MTD NEIAED gp 117mg/m\(^2\)

Temozolomide

- Does not require metabolism by hepatic mechanisms
- Spontaneously hydrolyzes to active intermediates
- Serum levels and effectiveness should not be altered by co-administration of EIAED
# Anticonvulsants

## Group A
**Anticonvulsants That Induce Hepatic Enzymes**

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Trade Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenytoin</td>
<td>Dilantin</td>
</tr>
<tr>
<td>Carbamazepine</td>
<td>Tegretol</td>
</tr>
<tr>
<td>Phenobarbital</td>
<td>Phenobarbital</td>
</tr>
<tr>
<td>Primidone</td>
<td>Mysoline</td>
</tr>
<tr>
<td>Oxcarbazapine (1999)</td>
<td>Trileptal</td>
</tr>
</tbody>
</table>

## Group B
**Anticonvulsants That Cause Modest or No Hepatic Induction**

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Trade Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valproic acid</td>
<td>Depakote</td>
</tr>
<tr>
<td>Gabapentin (1993)</td>
<td>Neurontin</td>
</tr>
<tr>
<td>Felbamate (1993)</td>
<td>Felbatol</td>
</tr>
<tr>
<td>Lamotrigine (1994)</td>
<td>Lamictal</td>
</tr>
<tr>
<td>Topiramate(1996)</td>
<td>Topamax</td>
</tr>
<tr>
<td>Tiagabine (1997)</td>
<td>Gabtril</td>
</tr>
<tr>
<td>Levetiracetam (1999)</td>
<td>Keppra</td>
</tr>
<tr>
<td>Zonisamide (2000)</td>
<td>Zonagram</td>
</tr>
<tr>
<td>Pregabalin(2005)</td>
<td>Lyrica</td>
</tr>
<tr>
<td>Lacosamide (2008)</td>
<td>Vimpat</td>
</tr>
</tbody>
</table>
To Treat or Not To Treat

- 113 physicians in Rhode Island were questioned regarding their practice of rx AEDs to patients with newly dx BT who had not yet experienced Sz prophylaxis (No. (%))

<table>
<thead>
<tr>
<th>Specialty</th>
<th>#</th>
<th>yes</th>
<th>no</th>
</tr>
</thead>
<tbody>
<tr>
<td>oncology</td>
<td>42</td>
<td>21 (50)</td>
<td>21 (50)</td>
</tr>
<tr>
<td>neurology</td>
<td>38</td>
<td>20 (53)</td>
<td>18 (47)</td>
</tr>
<tr>
<td>neurosurg</td>
<td>21</td>
<td>17 (81)</td>
<td>4 (19)</td>
</tr>
<tr>
<td>Radonc</td>
<td>12</td>
<td>4 (33)</td>
<td>8 (67)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>113</td>
<td>62 (55)</td>
<td>51 (45)</td>
</tr>
</tbody>
</table>
Results of Rhode Island Study

• 55% of physicians routinely Rx prophylactic AED in newly dx BT patient

• Most Neurosurgeons did (17/21 - 81%)

Most radiation oncologists (8/12 -67%) did not
Study Classification

• Class I: evidence provided by one or more well designed randomized, controlled clinical trials, including overviews (meta-analysis) of such trials

• Class II: evidence provided by one or more well designed observational studies with concurrent controls such as case-control or cohort studies
Calculated odds ratios were used:

\[ \text{probability of an event (sz on AED)} = 1 \]

reference group (sz no AED)
• Meta-analysis was conducted on sz incidence using all identified prospective, randomized clinical trials

• 12 studies met criteria for AED prophylaxis in BT patients (ie. Prophylactic AED vs no AED)

4 studies provided Class I evidence
# Meta-analysis of Sz Incidence for Class I Trials

<table>
<thead>
<tr>
<th>Reference</th>
<th>Sz incidence OR (95% CI)</th>
<th>Sz-free surv OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forsyth</td>
<td>0.82 (0.33-2.01)</td>
<td>1.17 (0.75-1.82)</td>
</tr>
<tr>
<td>Glantz</td>
<td>1.69 (0.61-4.63)</td>
<td>0.88 (0.54-1.46)</td>
</tr>
<tr>
<td>Franceschetti</td>
<td>0.36 (0.07-1.17)</td>
<td>NA</td>
</tr>
<tr>
<td>North</td>
<td>1.85 (0.56-6.12)</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Meta-analysis</strong></td>
<td><strong>1.09 (0.63-1.89)</strong></td>
<td><strong>1.03 (0.74-1.44)</strong></td>
</tr>
</tbody>
</table>

OR: odds of a sz in the AED prophylaxis gp relative to the no prophylaxis gp
Results cont’d

• For Class I data, meta-analysis of four studies gave an OR of 1.09 (0.63-1.89) at 95% CI. These studies did not provide statistical evidence of an effect of AED prophylaxis on seizure incidence
Recommendations

• In patients with newly dx brain tumors, anticonvulsant medications are not effective in preventing first seizures. Because of their lack of efficacy and their potential side effects, prophylactic anticonvulsants should not be used routinely in patients with newly diagnosed brain tumors (standard)
Recommendation II

• In patients with brain tumors who have not had a seizure, tapering and discontinuing anticonvulsants after the first postoperative week is appropriate, particularly in those patients who are medically stable and who are experiencing side effects (guideline)
Summary Cont’d

• AAN does not recommend AED prophylaxis for brain tumor patients
• Think of brain tumors as a chronic disease
• Minimize drug interaction by selecting the AED best for your patient
SEIZURES & BRAIN TUMORS

• High grade tumors 30%
• Due to secondary causes
  • Edema
  • Scar tissue/Surgical changes
  • Progression
  • Treatment effect-irritates brain
SEIZURES & BRAIN TUMORS

• 60% will fail a first line anticonvulsant
• Monotherapy preferred
• 72% recurrence rate if taken off medications after seizure free interval
• Patients with low grade tumors have a higher incidence of seizures but a longer life span
CHOOSING AN ANTICONVULSANT

• Urgency
• IV formulation
• Quick onset
  • Had to rely on 1\textsuperscript{st} generation drugs
  • Now have 2\textsuperscript{nd} generation options
MEDICATION SIDE EFFECTS
CHOOSING AN ANTICONVULSANT

- Initial
  - Dilantin - Not good for long term
  - Keppra
  - Vimpat
- Add on or change
  - Second generation have less side effects
  - Secondary benefits
DRUG INTERACTIONS

• Interaction with other medications
  • Steroids
  • Chemotherapy
  • Antidepressants
  • Anti-smoking agents
  • Stimulants (fatigue)
DRUG INTERACTIONS

• Interaction with other medications
  • Birth control pills
  • Anticoagulants (DVT’s)
  • Alternative therapies: (70% not reported, potentially eliptogenic)
I'd like this prescription filled.

Sorry, my friend... can't do it.

Why not?

This drug has so many side effects, you're better off with the disease.
What are physicians doing since the AAN Guidelines came out?

Study in 2005 showed 70% of HCP’s not following guidelines (Soimin, Angelov, Li, 2005, Journal of Neuro-Oncology 74 (2))
PHENYTOIN (DILANTIN)

- **Pros**
  - IV, quick onset, “old standby”

- **Cons**
  - fatigue, cognitive impairment, ataxia, visual disturbance, nystagmus, skin reaction

- Gum changes, bone loss

- Interactions, fluctuating levels
Carbamazepine (Tegretol)

- **Cons**
  - Similar to dilantin
  - Skin reactions (cross-reactivity)
  - Can affect blood counts (agranulocytosis)
  - Trileptal: hyponatremia

- **Pros**
  - Relieves nerve pain
Valproic Acid (Depakote)

- **Cons**
  - Hepatic clearance
  - Weight gain, hair loss/thinning, increased bleeding time, thrombocytopenia, tremor

- **Pros**
  - Mood stabilizer
  - Headaches
  - In gliomas does it improve tumor tx?
Gabapentin (Neurontin)  
Pregabalin (Lyrica)

- **Cons**
  - Not good as monotherapy
  - Weight gain, fluid retention

- **Pros**
  - Relieves nerve pain
B.C.

by johnny hart

HAVE YOU PUT ON WEIGHT?

NAH, NOT REALLY. I'M JUST RETAINING WATER.

PLANNING TO HIKE THE SAHARA?
Lamotrigine (Lamictal)

Cons
• Rash
• Very slow dose escalation (8 weeks)

Pros
• Mood stabilizer
Topiramate (Topamax)

- **Cons**
  - Cognitive impairment “dopamax”
  - Very slow dose escalation
  - Kidney stones
  - Parasthesias

- **Pros**
  - Weight loss
  - Headaches
Zonisamide (Zonegran)

- **Cons**
  - Sulfa allergy
  - Rash
  - Kidney stones

- **Pros**
  - Headache
  - Weight loss
Keppra (Levetiracetam)

• Cons
  • Psychological effects: irritability, anger, “Kepprage”
  • Vitamin B6
  • Decrease dose
  • Change therapy
Keppra (Levetiracetam)

• Pros
  • Monotherapy
  • Quick start (days)
  • IV form
  • XR once a day dosing (compliance & side effects)
  • Clinical trials in brain tumor
  • 80% seizure free
  • 73% as monotherapy
Lacosamide (Vimpat)

- Cons
  - Partial seizures only as add on
  - Relatively new
  - Dizziness, ataxia, syncope, visual disturbance, increased PR interval
Lacosamide (Vimpat)

- Pros
  - Unique mechanism of action: slow inactivation of sodium channels
  - Positive interaction as add on with second generation drugs particularly Keppra
  - Moderate dose escalation (2 weeks)
Cutaneous Reactions

- Dilantin, Tegretol, Lamictal (25%)
- Cross-reactivity
- Can be severe (Stevens-Johnson)
- Usually appear within 60 days
- Masked by steroids
- Increases local response to radiation
- Worse in immunocompromised patients
Brain Tumors and Seizures

• Limited research especially in second generation drugs
• Need for more clinical trials of anticonvulsants in the brain tumor patient population
• Combo of chemo and anticonvulsant therapy (helping or hurting?)
Approaches To Seizures

• Patients with intractable seizures
• Undergo Epilepsy evaluation
• Surgery: reduction/elimination of seizures?
Case Study #1

• MD 49 year old R handed female
  • 1\textsuperscript{st} seizure at age 15, partial complex, Dilantin
  • 1\textsuperscript{st} generalized seizure at age 16
  • Phenobarbital, Dilantin, Tegretol, Lamictal, Topamax, Neurontin, Depakote, Primadone, Ativan (w addiction)
  • Longest seizure free period: 2 months
  • Prior neuroimaging negative
  • Required psychiatric intervention
Case Study #1

- Associated with menses so came to CCF to see Epilepsy doctor who specialized in hormone-induced seizures November 2004 (age 43)
- Underwent extensive evaluation in EMU
- Switched to Keppra & Trileptal
- MRI showed left temporal lesion

Underwent seizure surgery 11/24/04

Final pathology: Low grade oligoastrocytoma, 1p intact
Case Study #1

- Referred to Brain Tumor Center
- Weaned off Trileptal
- Weaned off Keppra late 2008
- Remains seizure free
- Serial scans stable with no further treatment
- Significant improvement in quality of life: driving, working, says she feels like she spent most of her early life “in a fog”
DM Recent MRI July 2012
Case Study #2

- CP 55 year old R handed female
- 1\textsuperscript{st} seizure at age 24, partial complex
- Associated with menses, intractable (20+/month)
- L temporal lesion resected 3/88: gliosis
- Remained intractable on Tegretol & Topamax
Case Study #2

- Came to CCF 1997 for seizure work up (age 42)
- Extensive work up, EMU
- MRI showed L temporal lesion
- Seizure surgery 3/12/98
- Final pathology: Low grade oligoastrocytoma
CP Pre-op MRI 1996
Case Study #2

- Referred to Brain Tumor Center
- Seizure free since surgery
- Remains on Tegretol XR 400mg bid by choice
- Serial scans stable without treatment
New Approach for Intractable Seizures

- Patients with low grade brain tumor (could also be for high grade)
- In remission with good prognosis
- Intractable seizures
- Epilepsy evaluation

Possible reduction in seizures
Medication change or surgery
Brain Tumors & Seizures

• Most patients experience seizure control with treatment of the tumor i.e. surgery, radiation, medication and chemotherapy

About 15% will continue to have intractable seizures
Tumor Surgery vs Seizure Surgery

• Tumor Surgery
  • Diagnosis
  • Remove tumor/decrease mass effect
  • Gross Total Resection > 95% removal associated with better outcomes
  • Urgency
Tumor Surgery vs Seizure Surgery

- Mapping used to find critical functions: motor/speech/memory, not the seizure focus
- Target is the tumor
- Seizure focus not always in tumor or the portion of tumor removed

Different approaches, different outcomes
Brain Tumors & Seizures

- Most patients with intractable seizures have low grade tumors with good/long term prognosis
- Seizures significantly impact Quality of Life

Multiple medications cause significant side effects
Tumor Surgery vs Seizure Surgery

- Seizure surgery
  - Often as a second surgery in brain tumor patients
  - Extensive & time consuming work-up
- Goal: Remove seizure focus
SEEG: Stereoelectroencephalography

- Invasive seizure monitoring
- Depth electrodes are passed through burr holes
- Less invasive and measure larger areas of brain
- Minimal tissue damage
Case Study #3

• DK 34 year old right handed female
  • Delivered twins 10/29/04
  • Post partum anxiety attacks 1-3/day
  • Generalized seizure 12/2/04 (age 28)
  • MRI R fronto-temporal mass with mild enhancement
  • Biopsy 12/7/04
  • Final pathology: Low grade astrocytoma, 1p19q deleted
Case Study #3

- Post op DVT/PE: filter & coumadin (long term)
  - Treated with Temodar for 2 cycles with severe myelosuppression
  - Switched to Accutane
  - On Keppra with 1-2 seizures daily
  - Generalized seizure November 2005
  - Keppra increased to 4000mg daily
  - Topamax added and increased to 400mg daily
Case Study #3

• Lamictal added
• Neurontin added
• Completed 35 cycles Accutane with stable scans
• Referred to Epilepsy January 2008
• Extensive work up, EMU

Seizure surgery 6/12/08
Final pathology: Low grade glioma
DK Recent MRI 2012
Case Study #3

- Restarted on Accutane post op
- Neurontin weaned off
- Lamictal weaned off
- Keppra weaned off
- Accutane stopped April 2009
- Remains on Topamax 200mg bid

Seizure free since surgery & no progression
Case Study #4

- CW 43 year old R handed male
  - Generalized seizure 4/8/04
  - MRI w/o GAD “stroke” L temporal
  - Started on Dilantin
  - Sought 2nd opinion
  - Repeat MRI w GAD & PET 9/04 - tumor
  - 9/20/04 Biopsy

Final pathology: Low grade astrocytoma
CW Axial MRI 2010
Case Study #4

• To CCF in November 2004 (age 37)
• Intractable seizures on Dilantin
• Keppra added
• Pathology review: Low grade glioma, 1p19q deleted

Treated with Temodar x 10 cycles with delays ending February 2006

2008 Lamictal added & still seizing
Case Study #4

- Referred to Epilepsy
- Extensive work up, EMU
- Surgery moderate to high risk to memory & speech
- School teacher
- Deferred surgery

Remains on Keppra 1750mg bid, Dilantin 450mg qd and Lamictal 200mg bid

Stable scans, still has seizures
Case Study #5

- MK 26 year old R handed female
- December 2007 partial complex seizures
- MRI: R frontal temporal mass
- Subtotal? resection 1/9/08
- Final pathology: Low grade astrocytoma
- Continued to have seizures on Dilantin
MK MRI Pre-Op 2008
Case Study #5

- To CCF March 2008 (age 23)
- Switched to Keppra
- Generalized seizure April 2008 during switch
- Carbatrol added at outside ER
- Referred to Epilepsy
- Needed surgery, why not seizure surgery
Case Study #5

- Extensive work up, EMU
- Seizure surgery 6/13/08
- Final pathology: Low grade astrocytoma, intact
- Seizure post op during steroid taper
- Lamictal added to Keppra
- Seizure free since
Case Study #5

- Tumor progression November 2008
- Treated with Radiation/Temodar
- Remains seizure free
- Scans stable with no further treatment
- On Lamictal 150mg bid and Keppra 1500mg bid
- Independent & driving
CONCLUSION

• Seizures can significantly impact QOL in brain tumor patients
• Patients with low grade tumors have the highest incidence of seizures but the better prognosis
• In those patients with intractable seizures and in tumor remission, evaluation for Seizure surgery may be a reasonable option
The Cleveland Clinic
Brain Tumor Institute