

Epilepsy Surgery



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BC Epilepsy Society
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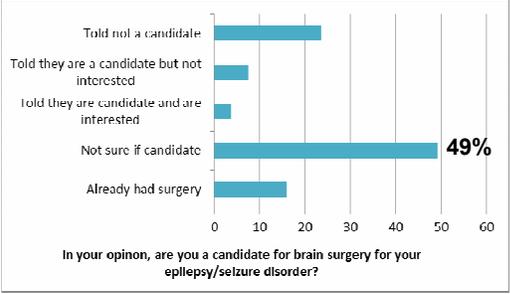
Epilepsy & Behavior

Journal homepage: www.elsevier.com/locate/yebeh

Patient perceptions and barriers to epilepsy surgery: Evaluation in a large health region

Chantelle Hrazdil^a, Jodie I. Roberts^{a,b}, Samuel Wiebe^{a,b}, Khara Sauro^{a,b}, Michelle Vautour^a, Alexandra Hanson^a, William Murphy^a, Neelan Pillay^a, Paolo Federico^{a,c}, Nathalie Jetté^{a,b,k}

While 83% aware that surgery can sometimes be an option for PWE...

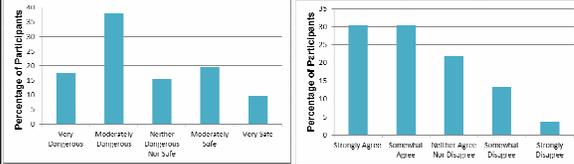


Response	Percentage
Told not a candidate	~25%
Told they are a candidate but not interested	~10%
Told they are candidate and are interested	~5%
Not sure if candidate	49%
Already had surgery	~15%

In your opinion, are you a candidate for brain surgery for your epilepsy/seizure disorder?

PWE Overestimate Risks

~60%



Response	Percentage of Participants
Very Dangerous	~10%
Moderately Dangerous	~35%
Neither Dangerous Nor Safe	~10%
Moderately Safe	~15%
Very Safe	~5%

Response	Percentage of Participants
Strongly Agree	~20%
Somewhat Agree	~25%
Neither Agree Nor Disagree	~15%
Somewhat Disagree	~10%
Strongly Disagree	~5%

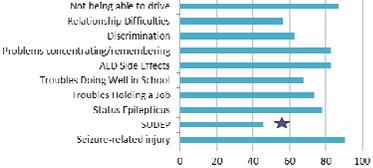
How dangerous is epilepsy surgery in carefully selected patients?

Brain surgery should be considered as a last resort. ***

Balancing Risks

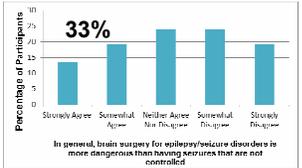


Seizures Surgery



Problem	Percentage
Not being able to drive	~85%
Relationship Difficulties	~75%
Discrimination	~70%
Problems concentrating/remembering	~65%
ADL Side Effects	~60%
Troubles Doing Well in School	~55%
Troubles Holding a Job	~50%
Status Epilepticus	~45%
SUDEP*	~40%
Seizure-related injury	~35%

In your opinion, which of the following are problems that sometimes happen to people that have seizures?



Response	Percentage of Participants
Strongly Agree	~15%
Somewhat Agree	33%
Neither Agree Nor Disagree	~25%
Somewhat Disagree	~20%
Strongly Disagree	~10%

In general, brain surgery for epilepsy/seizure disorders is more dangerous than having seizures that are not controlled.

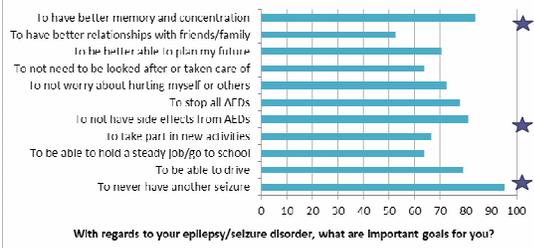
SUDEP

- **Sudden Unexpected Death in Epilepsy Patients**
 - sudden death in a person with epilepsy, who was otherwise healthy, that cannot be explained by an accident, injury or status epilepticus
 - Sudden death = 1:500 to 1:1000 (24X higher than the general population)
 - Risk highest in adults with uncontrolled nocturnal seizures

• www.epilepsy.com/sudep

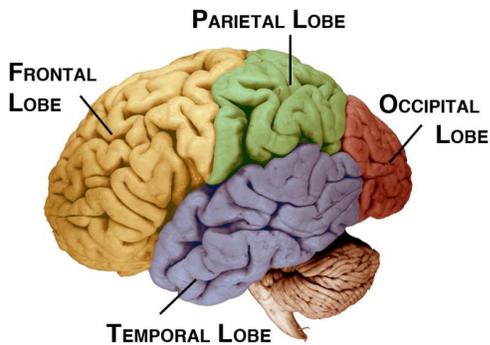
• www.sudepaware.org

Patient Treatment Goals



Objectives

1. To identify who may be a candidate for epilepsy surgery
2. To review the evidence base behind epilepsy surgery
3. To highlight different epilepsy surgical options, the benefits and the risks
4. To explore up and coming surgical treatment options for epilepsy



The Statistics

- Defn: a predisposition to recurrent unprovoked seizures
- Epilepsy affects 0.5-1% of the world population
- Incidence increasing with aging population
- Focal epilepsy/ seizures
 - more common
 - may be hard to control with medications

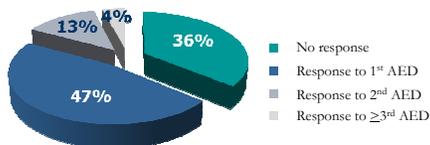


NEUROLOGY 2003;60: 538-547

EARLY IDENTIFICATION OF REFRACTORY EPILEPSY

PATRICK KWAN, M.D., AND MARTIN J. BRODIE, M.D.

Success of AED Drug Regimens



NEJM 2000; 342: 314-9

Drug Resistant Epilepsy

- “Failure of *adequate trials* of *two* tolerated appropriately chosen and used antiepileptic drug schedules (whether as one agent or in combination) to achieve sustained seizure freedom.”

ILAE Commission on Therapeutic Strategies, 2010

French et al, Epilepsia, 51 (6): 1069-1077

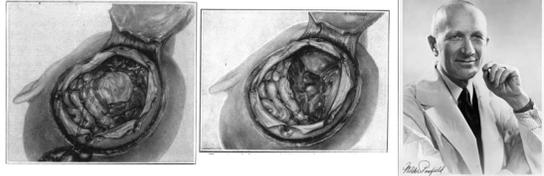
Adequate Medication trial

- Right drug
- Right dose
- Right duration
- Right drug levels
- Medication not stopped due to side effects alone
- Medication taken as prescribed

French et al, Definition of drug resistant epilepsy. *Epilepsia*, 2010 51 (6): 1069-1077

THE RADICAL TREATMENT OF TRAUMATIC EPILEPSY
AND ITS RATIONALE*
By WILDER PENFIELD, M.D.,
Clinical Professor of Neurological Surgery, McGill University,
Montreal CMAJ 1930

- Penfield established epilepsy surgery as an effective treatment for intractable patients



When to go for epilepsy surgery?

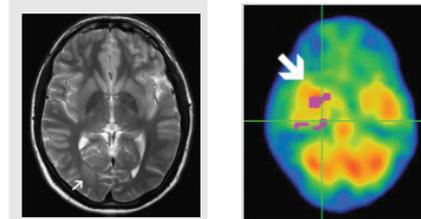
- “Resective surgery is a consideration in patients with drug-resistant, uncontrolled, disabling focal epilepsy **if the seizures originate from a region that can be removed with minimal risk of disabling neurologic or cognitive dysfunction.**”



Continuum – Epilepsy (June 2013)

Remaining Questions

- **What does it mean to have a surgical evaluation?**



What does a surgical evaluation entail?

- Almost all cases:
 1. Continuous video EEG
 2. MRI Brain
 3. Neuropsychology testing

Seizure Investigation Unit - Goal #1



Spell analysis: It is important for doctors to see what the event(s) look like on video.

Seizure Investigation Unit- Goal #2

Seizure localization: where on the brain are the seizures coming from?

MRI Brain -Mesiotemporal sclerosis

MRI Brain - Tumor

MRI Brain - May be normal

Neuropsychology Testing

- It is important to perform detailed testing of brain function (e.g. memory and language)
- Paper and pencil tests usually take 1-2 days.

What other tests may be done before surgery?

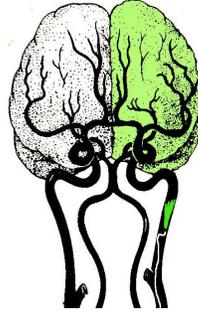
- Selective cases/center dependent:
 - Psychiatry consultation
 - Wada test (language and memory test)
 - Language fMRI
 - PET (positron emission tomography)
 - SPECT (single photon emission computed tomography)
 - Intracranial monitoring (inside the skull)

Psychiatry

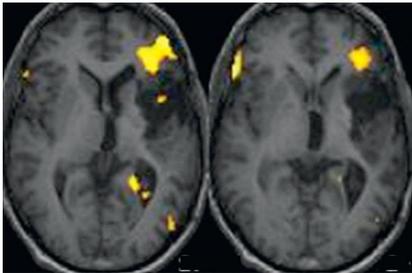
- People with epilepsy often struggle with anxiety and mood problems.
- It may be helpful to have a mental health assessment to help optimize your situation.



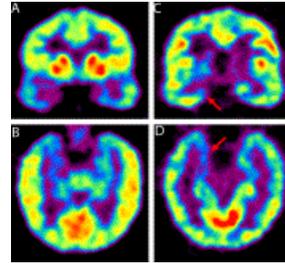
Wada Test



Language fMRI



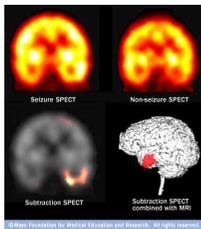
CEREBRAL PET



May help localize a seizure focus

CEREBRAL SPECT

- Between seizures: area of low blood flow
- During a seizure: area of high blood flow
- Subtract the two & coregister with MRI



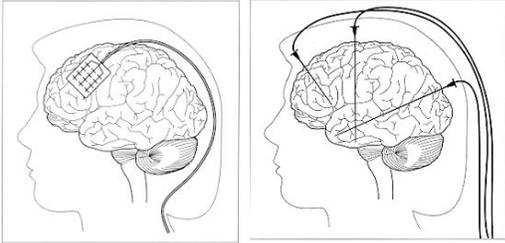
Remaining Questions

- **What if it is still unclear where the seizures are coming from?**

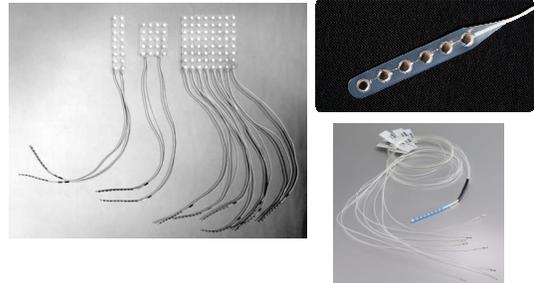


Intracranial monitoring

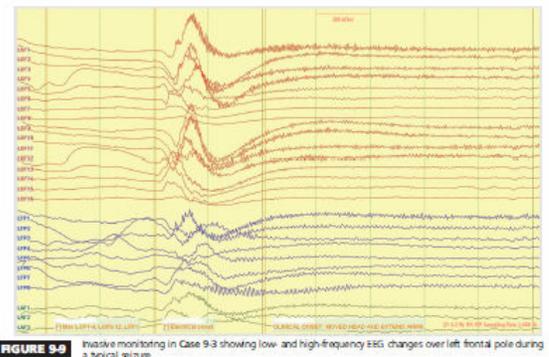
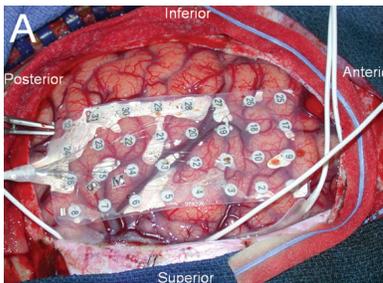
- 1) Subdural monitoring 2) Depth electrode monitoring



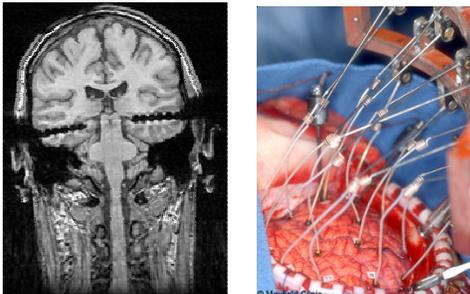
Intracranial monitoring - electrodes



Subdural Electrode Placement



Depth Electrodes



Neurosurgeon Consultation

- If you are felt to be a good candidate for epilepsy surgery, you will meet the neurosurgeon beforehand.



Remaining Questions

- **What is the evidence behind all of this?**



A literature review of the natural history, epidemiology and surgical outcomes of epilepsy, with a focus on localization-related epilepsy.

January 2009

LITERATURE REVIEW:

Embase + Pubmed +
Cochrane Database

5061 articles identified

763 met all inclusion and
exclusion criteria

>350 surgical series

15 topics reviewed

8 as systematic reviews

http://www.epilepsycases.com/funding_publications.html

The New England Journal of Medicine

Copyright © 2001 by the Massachusetts Medical Society

VOLUME 345

AUGUST 2, 2001

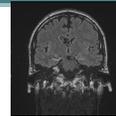
NUMBER 5

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 ELIASZEW, Ph.D.,
FOR THE EFFECTIVENESS AND EFFICIENCY OF SURGERY FOR TEMPORAL LOBE EPILEPSY STUDY GROUP*

**Surgery is superior to prolonged medical therapy
in medically refractory temporal lobe epilepsy.**

Study Population



Inclusion Criteria

- > 16 yo
- Temporal Lobe Seizures
- Seizures for \geq 1 year
- Seizures ~ monthly
- Failed prior trials of \geq 2 AEDs

Exclusion Criteria

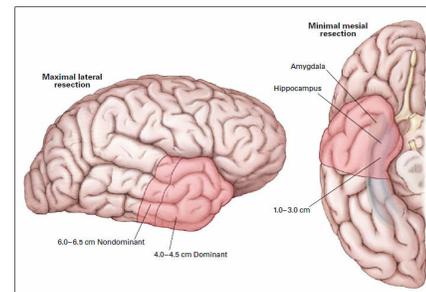
- Brain lesions - urgent OR
- Progressive brain disorders
- Active psychosis
- Pseudoseizures
- IQ < 70
- Previous epilepsy surgery
- Focal extratemporal EEG/MRI
- Bilateral equally severe TLE

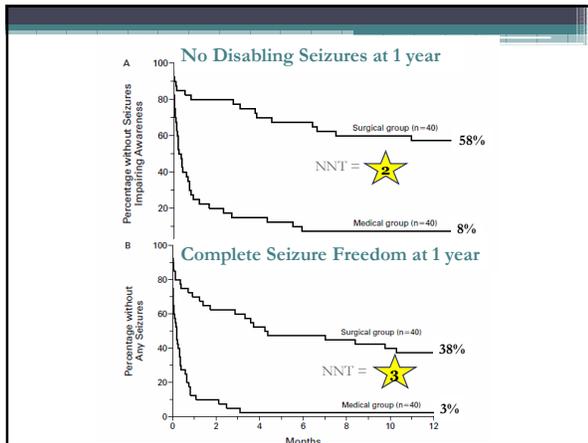
Study Methods

- 80 patients randomized to:
 - **1 year** waitlist for surgical evaluation vs.
 - Surgery w/i **4 wks**
- Surgical evaluation:
 - Scalp video EEG monitoring +/- subdural
 - MRI
 - Neuropsychology testing
 - +/- Wada test (language test)



Typical surgical resection for temporal lobe epilepsy





Early Surgical Therapy for Drug-Resistant Temporal Lobe Epilepsy

A Randomized Trial

Jerome Engel Jr, MD, PhD
 Michael P. McDermott, PhD
 Samuel Wiebe, MD
 John T. Langfitt, PhD
 John M. Stern, MD
 Sandra Dewar, RN
 Michael R. Sperling, MD
 Irenita Gardiner, RN
 Giuseppe Erba, MD
 Itzhak Fried, MD, PhD
 Margaret Jacobs, BA
 Harry V. Vinters, MD
 Scott Mintzer, MD
 Karl Kiebertz, MD, MPH
 for the Early Randomized Surgical Epilepsy Trial (ERSET) Study Group

Medical 19/19 (100%) still having seizures at 2 years
 Surgical 3/13 (23%) still having seizures at 2 years ... but fewer seizures

ERSET

JAMA, March 7, 2012—Vol 307, No. 9
Corrected on March 13, 2012

Remaining Questions

- What are the surgical complications?

NaturalNews.com

Surgical Risks

- Intracranial monitoring
 - Minor or temporary complication = 4.6%
 - Major or permanent complication = 0.6%

http://www.epilepsycases.com/funding_publications.html

Surgical Risks

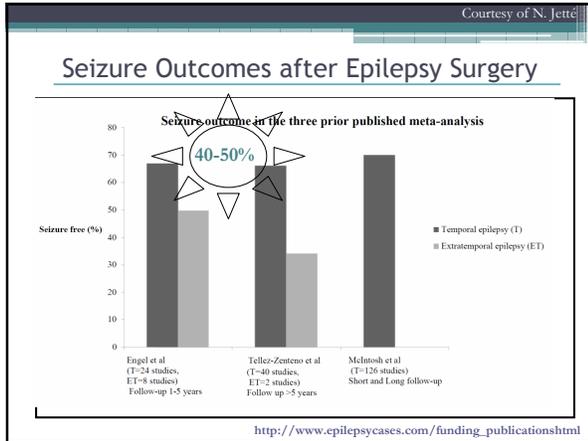
Resective Surgery

- Medical complications
 - ~5% minor, ~1% major
- Neurologic complications
 - ~10% minor, ~5% major
 - ~1.5% permanent hemiparesis
- Death ~0.4%

http://www.epilepsycases.com/funding_publications.html

Remaining Questions

- What about epilepsy outside the temporal lobe?



Remaining Questions

- What if the MRI is normal?

Studies have shown 45% seizure free rates

Wiebe, S et al. Epilepsy Research 2009; 89: 310-318

Remaining Questions

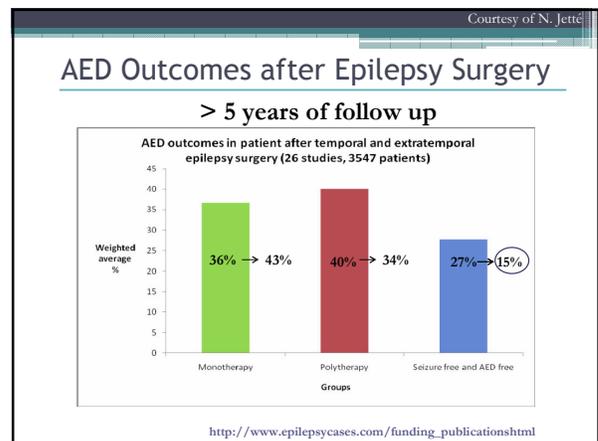
- What should be expected after surgery?

Recovery Period

- The hospitalization for epilepsy surgery is about 4-6 days
- Recovery usually takes a few weeks.
- You may be advised to take a few months off to recuperate at home.
- Most people resume their usual activities after 2-3 months.
- You will see your epilepsy specialist and surgeon in follow up.

Remaining Questions

- What happens with medications use after surgery?



Remaining Questions

- **What other outcomes are affected by surgery?**



Epilepsy Surgery Outcomes

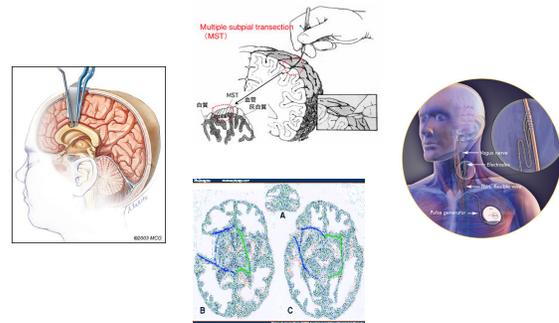
- **Neuropsychological** Jette et al. Epilepsia 2011; 52(5): 856-869
 - Most do not have significant decline in memory or thinking
 - Risk generally greater if language dominant hemisphere
- **Social outcomes** Jette et al. Epilepsia 2011; 52(5): 870-879
 - Full-time employment, driving, improved lifestyle, relationships, independence, education, finances
- **Psychiatric outcomes** Jette et al. Epilepsia 2011; 52(5): 880-890
 - improvement or no change *overall*
- **Quality of life** Wiebe et al. Epilepsy & Behavior 2011; 21: 441-445
 - 29/32 studies (91%) = positive effect on QOL

Remaining Questions

- **Are there other surgical options?**



Other Palliative Surgical Options



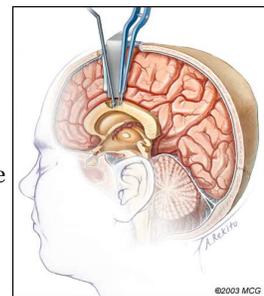
Vagus Nerve Stimulation

- Exact mechanism?
- Used more commonly in children
- ~50% reduction in seizure frequency in 50% of patients



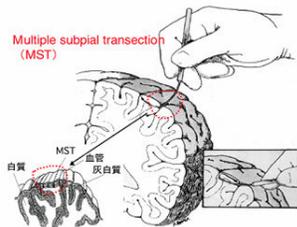
Corpus Callosotomy

- Commonly performed in children with drop attacks or disabling convulsions
- Anterior 2/3 vs. complete section of the tract connecting the two hemispheres of the brain



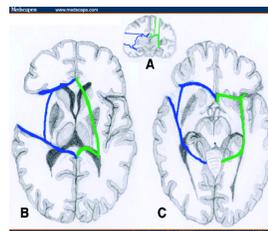
Multiple Subpial Transections

- Reserved for important cortex which can not be resected without high risk of neurologic deficit
- Generally not very effective



Hemispherectomy

- Disconnection of one side of the brain
- Very rarely done in conditions such as:
 - Sturge Weber syndrome
 - Hemimegalencephaly
 - Rasmussen's encephalitis



Remaining Questions

- **Is there anything up and coming?**



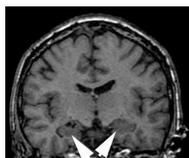
Investigational Procedures

1. Hippocampal stimulation
2. Anterior thalamic nucleus stimulation
3. Responsive neurostimulation system
4. Radiosurgery
5. Laser ablation therapy



Hippocampal Stimulation

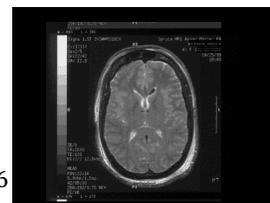
- Numbers for research recruitment have been low
- Initial data has not been very promising
- Research trials ongoing, although not in Canada



Electrical stimulation of the anterior nucleus of thalamus for treatment of refractory epilepsy

By 2 years, there was:

- ~50% reduction in seizure frequency
- 50% of patients had a $\geq 50\%$ seizure reduction
- 14/100 patients were seizure-free for at least 6 months



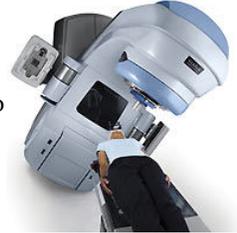
Responsive Neurostimulation

- RNS administers stimulation only if triggered by seizure activity.
- An investigational treatment for medically refractory epilepsy - currently under review by the FDA.

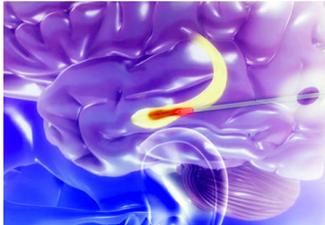


Radiosurgery

- E.g. gamma knife
- May be useful for areas which are hard to access
- Pilot trials have shown up to 65% response rates in temporal lobe epilepsy
- Exact indications TBD



MRI guided stereotactic guided laser ablation therapy



Remaining Questions

- **What is the optimal timing of surgery?**



Canadian Statistics

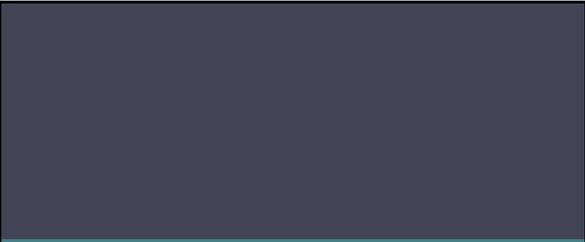
- Delays in undergoing epilepsy surgery average 10 yrs in children; 20 yrs in adults
- 1998-1999: 352 epilepsy surgeries/20,000 potential surgical candidates



Richard McLachlan, CJNS 2001; 28: 4-5

Conclusions

- Surgery may offer freedom from disabling seizures in people who have failed medications.
- Various tests are used to help tailor the benefits and risks of surgery on an individual basis.
- One must balance the risks associated with surgery with the risks of ongoing poorly controlled epilepsy.
- Epilepsy surgery should NOT be considered as a 'last resort.' Ask your doctor about it!



Questions?