How do we decide where to do resection?

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Pathology-based approach to epilepsy surgery

- Focal cortical dysplasia
- Hippocampal sclerosis
- Tumors
- Cavernoma
- Tuberous sclerosis

Focal Cortical Dysplasia

JNS PEDIATRICS

CLINICAL ARTICLE

J Neurosurg Pediatr 15:644–650, 2015

The influence of lesion volume, perilesion resection volume, and completeness of resection on seizure outcome after resective epilepsy surgery for cortical dysplasia in children

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Focal Cortical Dysplasia

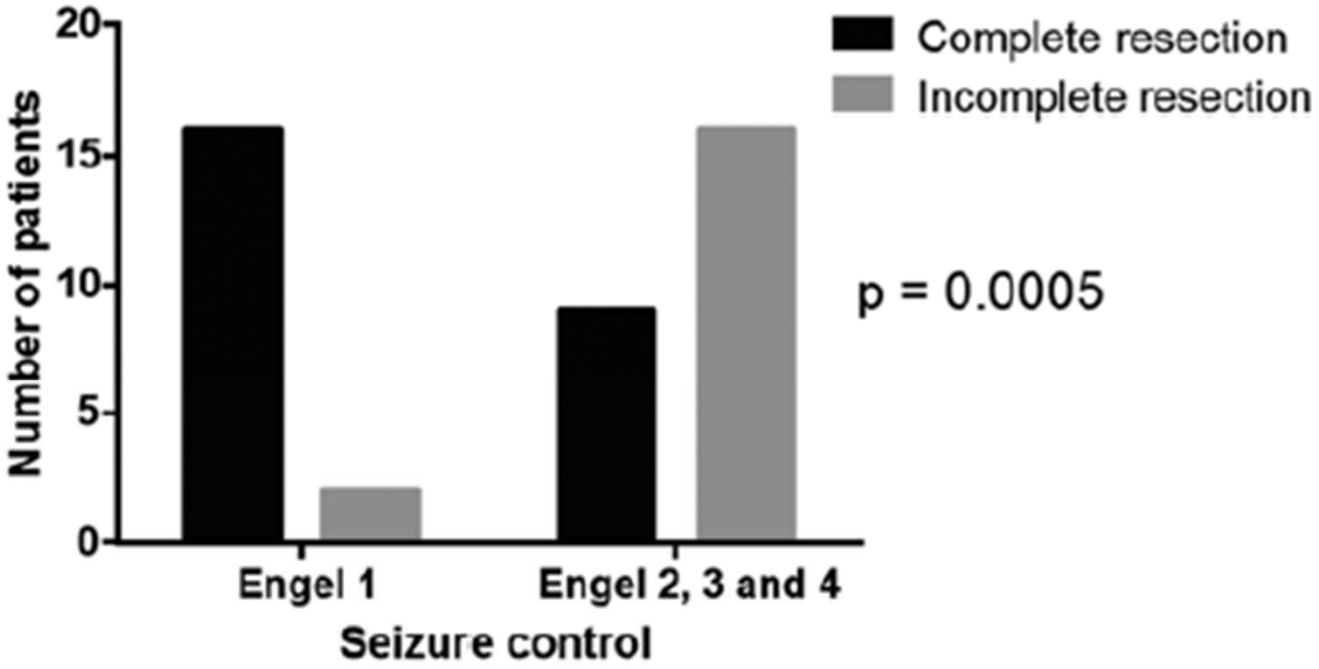


FIG. 2. Complete resection is significantly associated with seizure control.

Focal Cortical Dysplasia

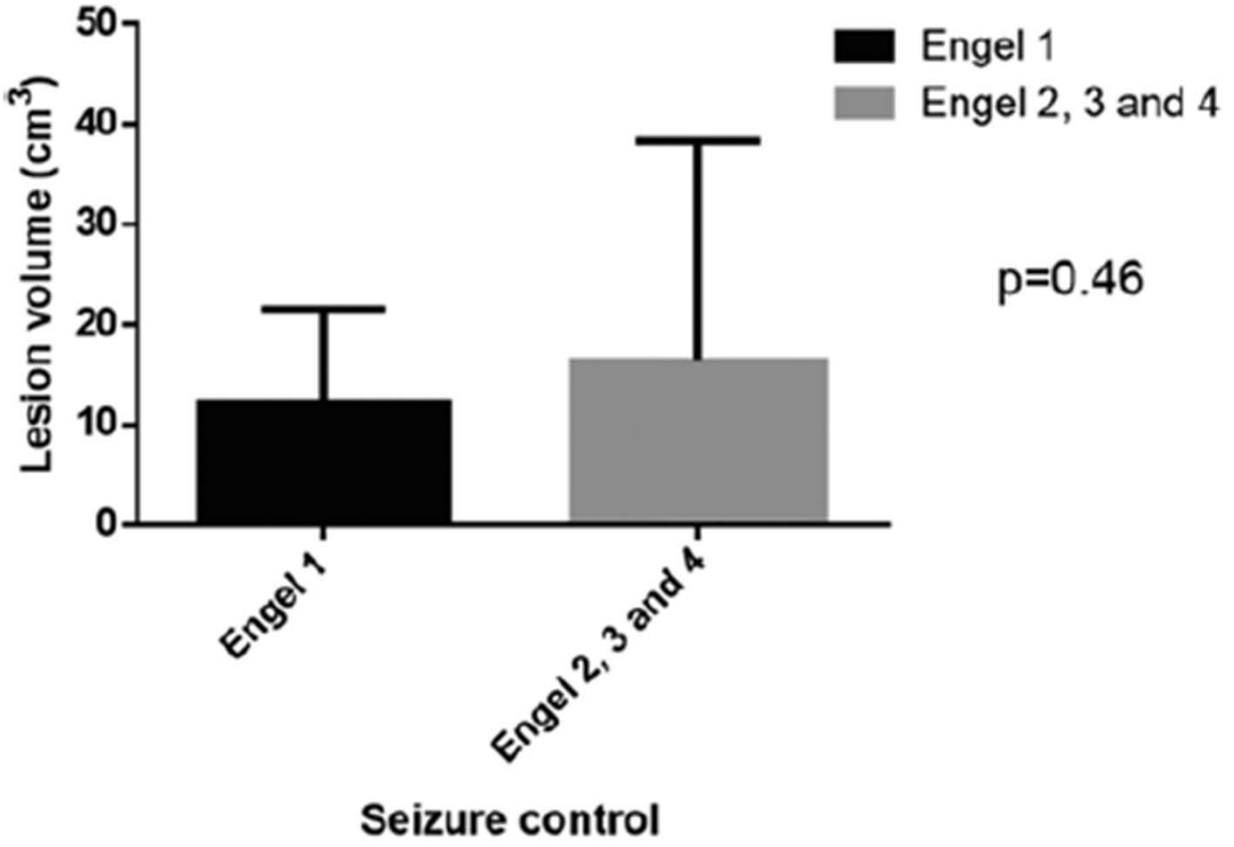


FIG. 3. Seizure control is not significantly associated with lesion volume.

Focal Cortical Dysplasia

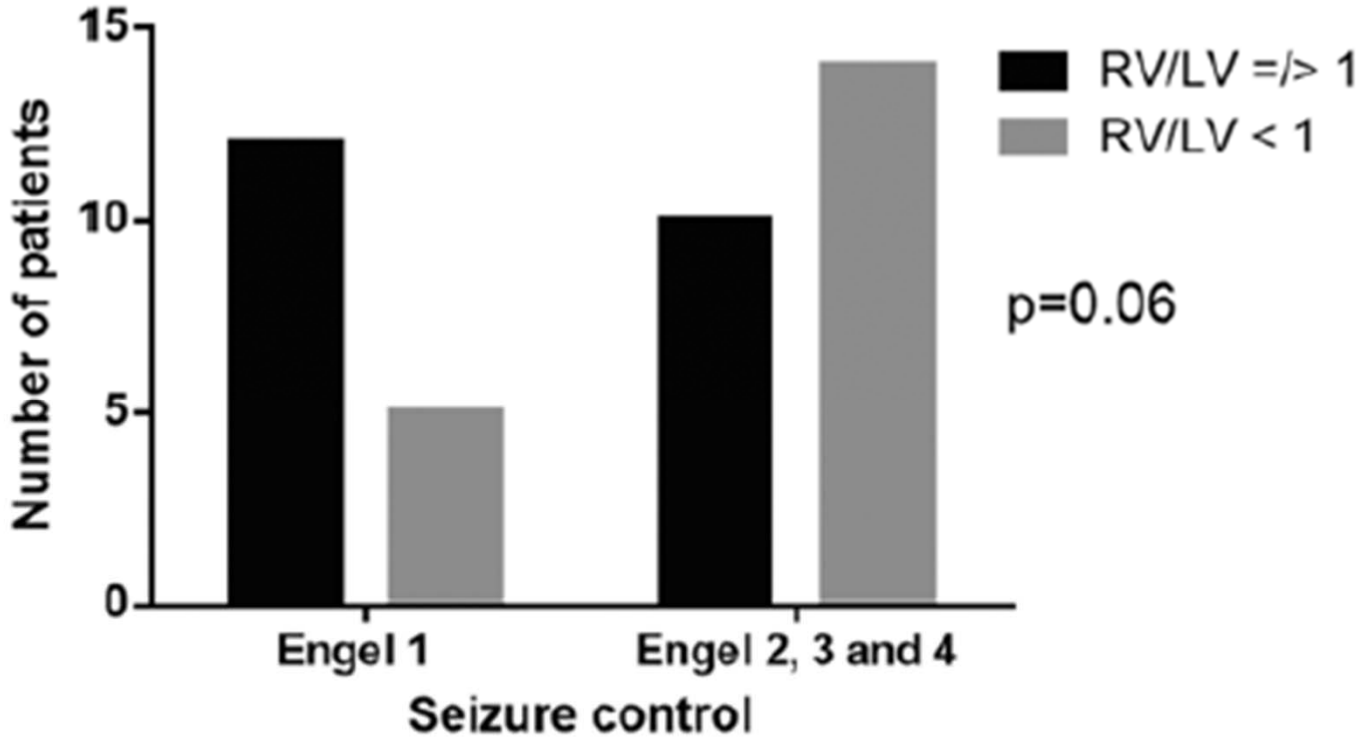


FIG. 4. Relationship of seizure control to increasing RV/LV ratio.

Focal Cortical Dysplasia

TABLE 6. Exact logistic regression results

Parameter	Exact OR Estimate	95% CI	p Value
Complete resection	6.062	1.108–∞	0.0350
Lesion volume	1.004	0.964–1.043	0.8735
Duration	1.001	0.987–1.016	0.8643
Temporal	0.607	0.060–8.388	0.9000
Histopathological results	1.261	0.195–15.467	1.000

Focal Cortical Dysplasia

- The **completeness** of FCD resection in children is a significant predictor of seizure freedom.

- Neither **lesion volume** nor the further **resection of perilesional tissue** is predictive of seizure freedom.

Hippocampal Sclerosis

Epilepsy Research (2015) 111, 26–32

journal homepage: www.elsevier.com/locate/epilepsyres

Selective amygdalohippocampectomy versus standard temporal lobectomy in patients with mesiotemporal lobe epilepsy and unilateral hippocampal sclerosis: post-operative facial emotion recognition abilities

Anne-Sophie Wendling[a,e], Bernhard J. Steinhoff[a,*], Frédéric Bodin[b], Anke M. Staack[a], Josef Zentner[c], Julia Scholly[b], Maria-Paula Valenti[b], Andreas Schulze-Bonhage[d], Edouard Hirsch[b]

Hippocampal Sclerosis

- Sixty patients who had presented with unilateral hippocampus sclerosis (HS) **without associated dysplasia or white matter blurring** and had become seizure-free postoperatively were includes.
- **Psychometric evaluation** was carried out with the Ekman 60 Faces Test and screened for depression and psychosomatic symptoms with the SCL-90 R and the BDI.
- .

Hippocampal Sclerosis

- Twenty-seven and 33 had undergone SAH and ATL. Patients and 30 controls obtained comparable scores in FER for surprise, happiness, anger and sadness.
- Concerning **fear and disgust** the patient group scored significantly worse.
- **Left-sided** operations led to the the most pronounced impairment. The **ATL** group scored significantly worse for recognition of **fear** compared with SAH patients.

Hippocampal sclerosis

- Inversely, after SAH scores for **disgust** were significantly lower than after ATL, independently of the side of resection.
- Unilateral temporal damage impairs FER. Different neurosurgical procedures may affect FER differently.

Hippocampal Sclerosis

Journal of
Neurology, Neurosurgery
& Psychiatry

Research paper

Hippocampal resection length and memory outcome in selective epilepsy surgery

Christoph Helmstaedter,[1] Sandra Roeske,[2] Sabine Kaaden,[2] Christian E Elger,[1] Johannes Schramm[2]

Hippocampal Sclerosis

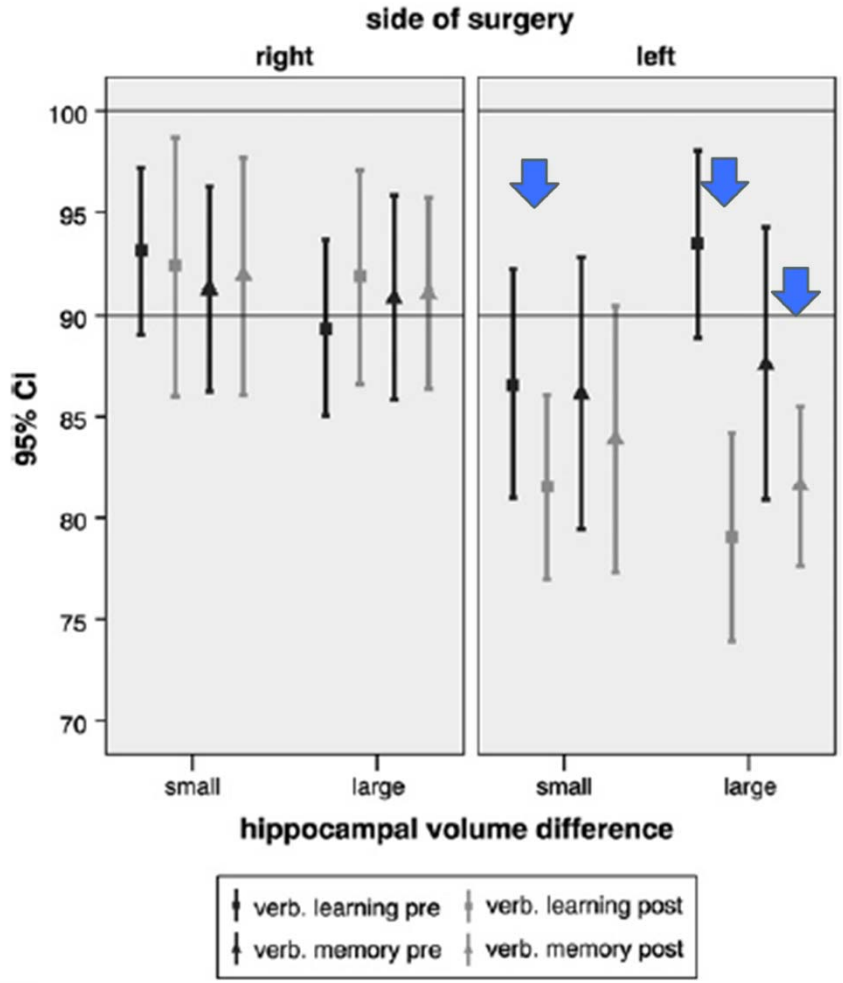
- Sixty seven patients selectively operated patients with hippocampal sclerosis (MRI evidence of pure mesio-TLE with hippocampal atrophy/sclerosis) were admitted for SAH (allocated to a **short** (2.5 cm, n=34) or a **long** (3.5 cm, n=33) mesial resection).

Hippocampal Sclerosis

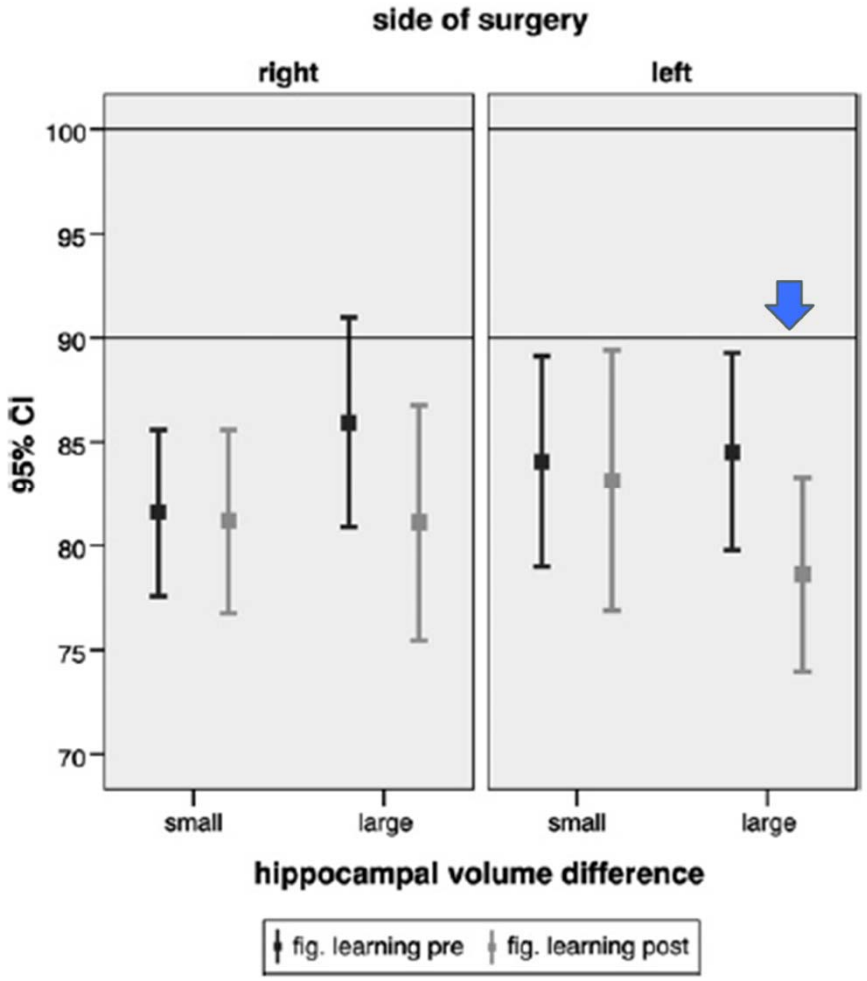
Table 3 Resection length, volume loss and seizure outcome

			Resection (intent to treat)			Hippocampal volume difference		
			Short (n (%))	Long (n (%))	Total	Small (n (%))	Large (n (%))	Total
Seizure free	Yes	N	19 (55.9)	25 (75.8)	44	20 (57.1)	24 (75)	44
	No	N	15 (44.1)	8 (24.2)	23	15 (42.9)	8 (25)	23
		N	34 (100)	33 (100)	67	35 (100)	32 (100)	67
			χ^2=2.9, df=1, p=0.12			χ^2=2.36, df=1, p=0.197		

Hippocampal Sclerosis



Hippocampal Sclerosis



Tumors

JNS JOURNAL OF NEUROSURGERY
OFFICIAL JOURNALS OF THE AANS SINCE 1944

J Neurosurg 111:1275–1282, 2009

Seizure outcome of epilepsy surgery in focal epilepsies associated with temporomesial glioneuronal tumors: lesionectomy compared with tailored resection

Clinical article

Marco Giulioni, M.D.,[1] Guido Rubboli, M.D.,[2] Gianluca Marucci, M.D.,[4] Matteo Martinoni, M.D.,[1] Lilia Volpi, M.D.,[2] Roberto Michelucci, M.D.,[2] Anna Federica Marliani, M.D.,[5] Francesca Bisulli, M.D.,[3] Paolo Tinuper, M.D.,[3] Laura Castana, M.D.,[6] Ivana Sartori, M.D.,[6] and Fabio Calbucci, M.D.[1]

Tumors

- 28 patients were divided into 2 groups, with 14 cases in each group. In **Group A (1991-2001)**, surgery was limited to the tumor (lesionectomy), whereas **Group B (2001-2006)** patients underwent tailored resection involving removal of the tumor and the epileptogenic zone as identified by a neurophysiological noninvasive presurgical study.

Tumors

6/14 = 42.8%

TABLE 1: Summary of results from patients in Group A (lesionectomy)*

Case No.	Age (yrs), Sex	Epilepsy Duration (yrs)	Pathology	Temporomesial Side	Resection	FU (yrs)	Engel Class
1	17, M	16	GG	lt	subtotal	14	I
2	18, M	5	GG	rt	total	14	I
3	29, F	16	GG	lt	total	14	II
4	23, M	4	GG	lt	total	9	II
5	20, F	2	GG	rt	subtotal	9	II
6	61, F	3	GG	rt	total	14	II
7	48, M	33	GG	lt	total	8	II
8	31, M	22	GG	rt	total	6.5	II
9	20, M	19	GG	lt	total	6.5	I
10	6, M	6	GG	rt	total	6.5	II
11	23, M	4	GG	rt	total	15	I
12	9, M	1	DNET	lt	subtotal	8	I
13	16, F	15.5	GG	rt	total	7	II
14	3, M	2	GG	rt	total	7	I

* FU = follow-up; GG = ganglioglioma.

Tumors

TABLE 2: Summary of results from patients in Group B (tailored resection)*

13/14 = 93%

Case No.	Age (yrs), Sex	Epilepsy Duration (yrs)	Pathology	Temporomesial Side	Op†	FU (yrs)	Engel Class
1	34, M	4	DNET & AD	lt	CorAH	6.5	Ia
2	36, F	13	GG	rt	CorAH	2.5	Ia
3	23, M	14	DNET & AD	rt	CorAH	6	Ia
4	12, F	1	GG & AD	lt	CorAH	4.75	Ia
5	15, F	2	GG	rt	CorAH	4.5	Ia
6	34, M	17	GG	lt	CorAH	4.25	Ia
7	48, F	21	GG & AD & HS	rt	CorAH	4.25	Ib
8	3, M	0.5	GG & CAD	lt	CorAH	3.25	Ia
9	5, F	3.5	GG	rt	CorAH	2.75	Ia
10	5, M	3	GG	lt	CorAH	2.75	Ia
11	17, F	1	PXA	rt	CorAH	2.5	Ia
12	26, M	5	GG	lt	CorAH	2	Ia
13	23, F	10	DNET	rt	CorAH	1.75	II
14	31, F	25	GG & HS	rt	AH	1	Ia

* AD = architectural dysplasia; AH = amygdalohippocampectomy; CAD = cytoarchitectural dysplasia; CorAH = cortectomy-AH; HS = hippocampal sclerosis.

† All patients underwent a lesionectomy in addition to the operation listed.

Tumors

- Their results demonstrate a better seizure outcome for temporomesial glioneuronal tumors associated with epilepsy in patients who underwent **tailored resection** rather than simple lesionectomy ($p = 0.005$).

Cavernomas

Acta Neuropathologica

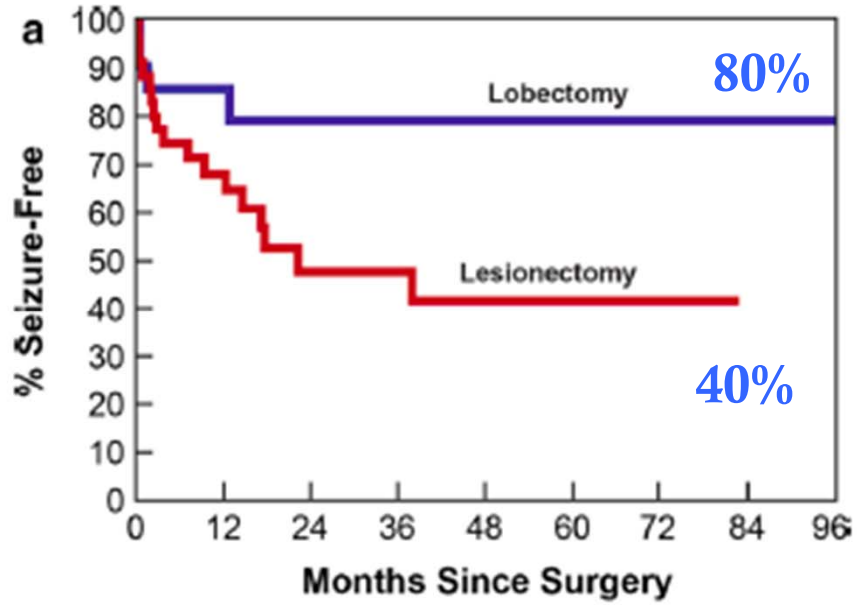
Acta Neuropathol (2014) 128:55–65
DOI 10.1007/s00401-014-1294-y

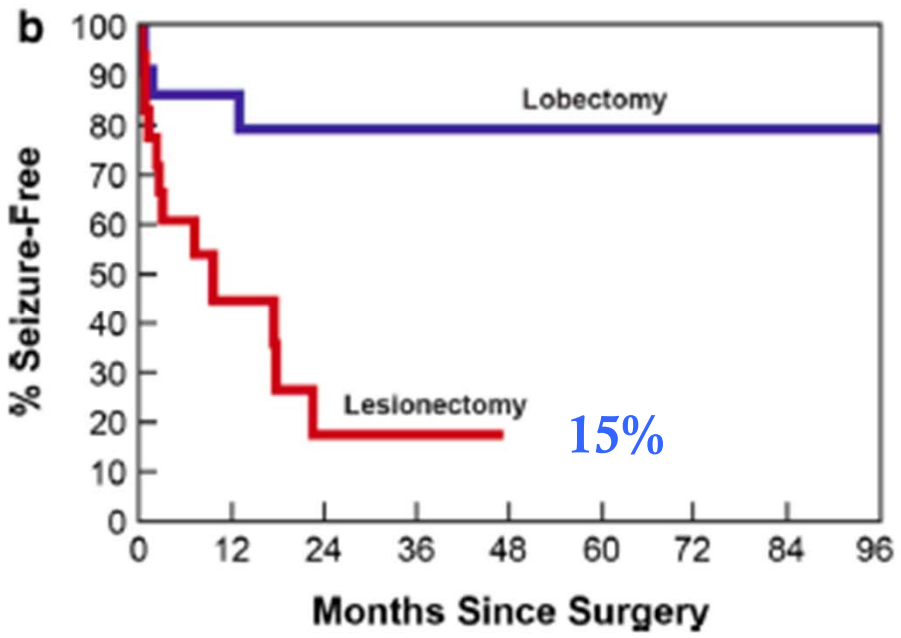
REVIEW

Cerebral cavernous malformations in the setting of focal epilepsies: pathological findings, clinical characteristics, and surgical treatment principles

Lara E. Jehi · Andre Palmini · Usha Aryal · Roland Coras · Eliseu Paglioli

Cavernomas





Overall

Temporal

Cavernomas

Table 2 Independent predictors of post-operative seizure recurrence with statistical significance following multivariable Cox proportional hazard modeling (whole model log-rank p test <0.0001)

	Risk ratio	95 % CI	Adjusted p value
Epilepsy duration (>5 years)	2.8	1.03–9.7	0.04
Lesionectomy (as opposed to lobectomy)	5.7	2.0–20.2	0.0007
Temporal or parietal localization (as opposed to frontal/insular)	7.1	2.3–31.2	0.0004

Cavernomas

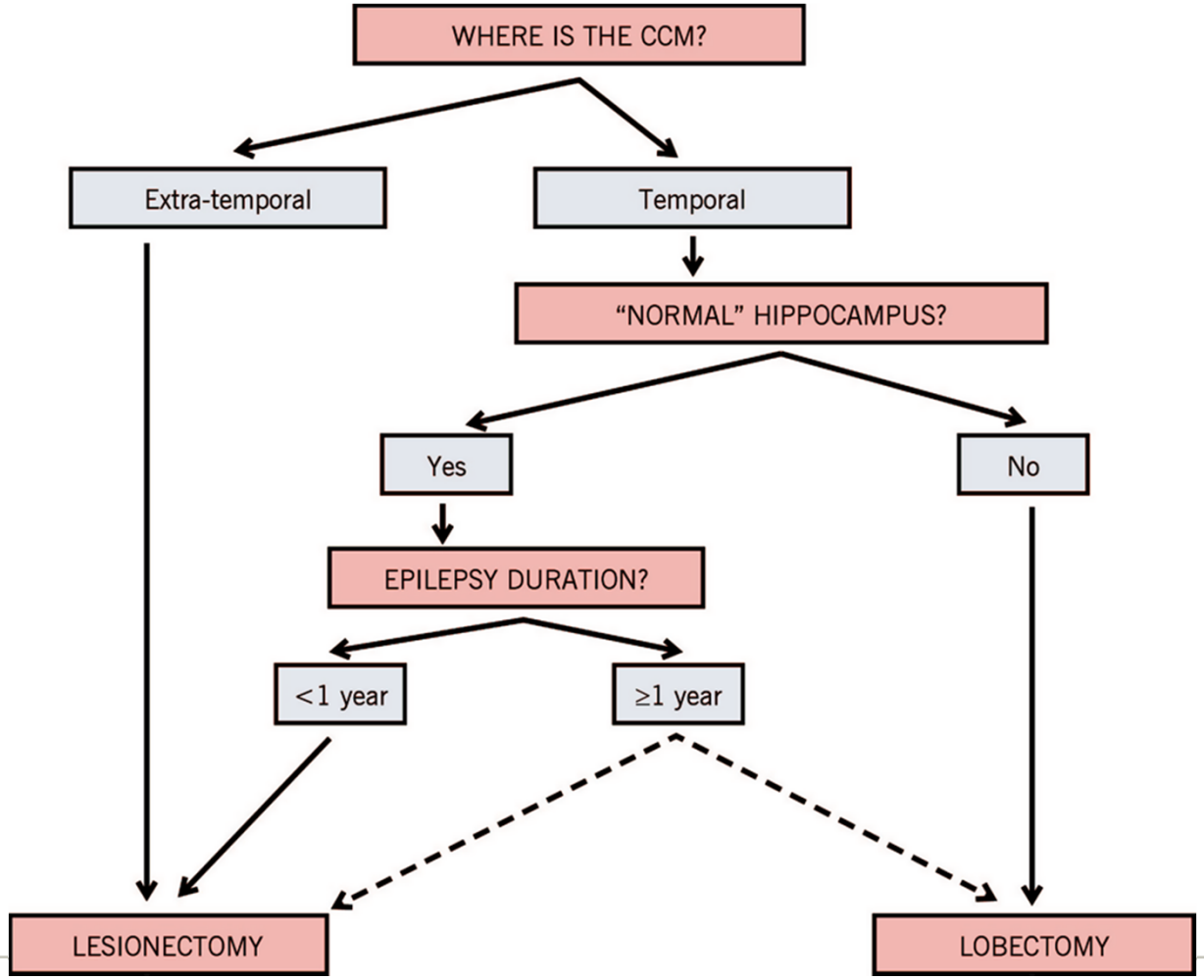
Table 3 The implications of the extent of temporal lobe resection in relation to seizure outcomes in the context of both "short" and "long" epilepsy duration

Temporal lobe surgery	Seizure free	Recurrent seizures	*p* value	Seizure free	Recurrent seizures	*p* value
Epilepsy duration	≤1 year			>1 year		
Center A[a]						
Type of surgery						
Lesionectomy	1 (100 %)	0 (0 %)	0.41	5 (29 %)	12 (71 %)	0.003
Lobectomy	2 (67 %)	1 (33 %)		16 (76 %)	5 (24 %)	
Epilepsy duration	≤5 year			>5 years		
Center A						
Type of surgery						
Lesionectomy	4 (57 %)	3 (43 %)	0.46	2 (18 %)	9 (82 %)	0.003
Lobectomy	6 (75 %)	2 (25 %)		12 (75 %)	4 (25 %)	
Center B						
Lesionectomy	4	0	NA	9 (90 %)	1 (10 %)	0.43
Lobectomy	0	0		3 (75 %)	1 (10 %)	
Combined data						
Lesionectomy	8 (73 %)	3 (27 %)	0.91	11 (52 %)	10 (48 %)	0.13
Lobectomy	6 (75 %)	2 (25 %)		15 (75 %)	5 (25 %)	

The results are shown with cut-offs of either 1 or 5 years

[a] The analysis of 1-year cut-off could only be done with one center, since all patients included in center B had a longer epilepsy duration

Cavernomas


WHERE IS THE CCM?
Extra-temporal
Temporal
"NORMAL" HIPPOCAMPUS?
Yes
No
EPILEPSY DURATION?
<1 year
≥1 year
LESIONECTOMY
LOBECTOMY

Tuberous Sclerosis

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RESEARCH—HUMAN—CLINICAL STUDIES

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Shaun D. Rodgers, MD§
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Sumeet Vadera, MD¶
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Mary B. Connolly, MD#
Philippe Major, MD**

Resective Epilepsy Surgery for Tuberous Sclerosis in Children: Determining Predictors of Seizure Outcomes in a Multicenter Retrospective Cohort Study

Tuberous Sclerosis

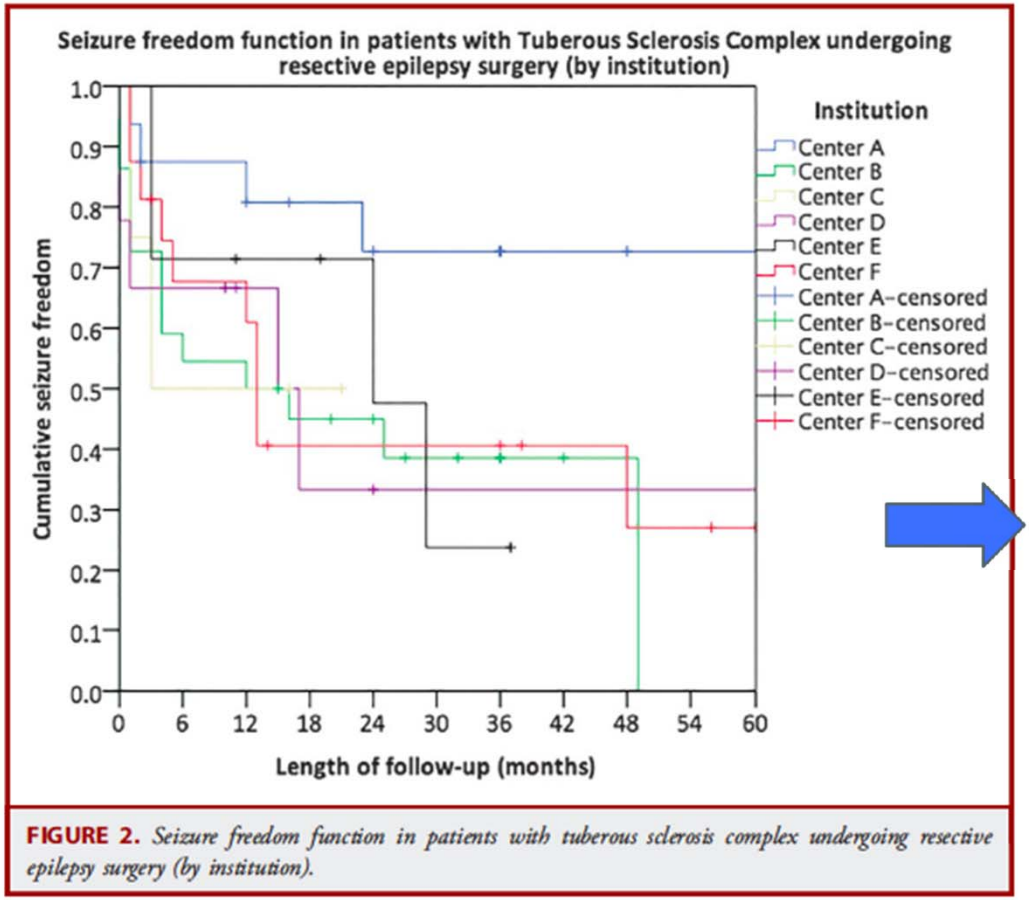

FIGURE 2. *Seizure freedom function in patients with tuberous sclerosis complex undergoing resective epilepsy surgery (by institution).*

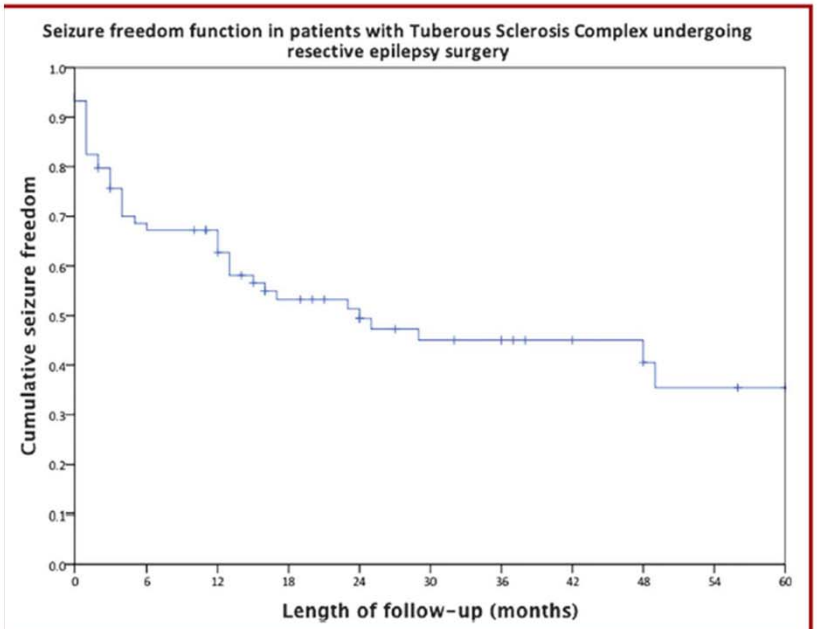

FIGURE 1. *Seizure freedom function in patients with tuberous sclerosis complex undergoing resective epilepsy surgery.*

Tuberous Sclerosis

TABLE 3. Univariate Analysis Hazard Ratios, Confidence Intervals, and *P* Values of Independent Variables[a]

Independent Variable	HR	Lower 95% CI	Higher 95% CI	*P* Value
Female	1.107	0.589	2.083	.57
Younger $\log_{10}$ (age at seizure onset)[b]	2.033	1.032	4.000	.04
Less $\log_{10}$ (preoperative seizure frequency)	1.044	0.591	1.845	.88
No infantile spasms	1.456	0.755	2.809	.26
Generalized seizures	1.125	0.575	2.201	.73
Younger $\log_{10}$ (age at surgery)	1.063	0.494	2.288	.88
Size of predominant tuber[b]	1.026	0.994	1.060	.12
Tuber burden	1.012	0.967	1.059	.61
Surgery type (tuberectomy(ies) vs larger resection)[b]	1.855	0.920	3.741	.08
Focal interictal EEG abnormality	1.528	0.781	2.989	.22
Focal ictal EEG abnormality	1.016	0.532	1.940	.96

[a]HR, hazard ratio; CI, confidence interval; EEG, electroencephalography.
[b]

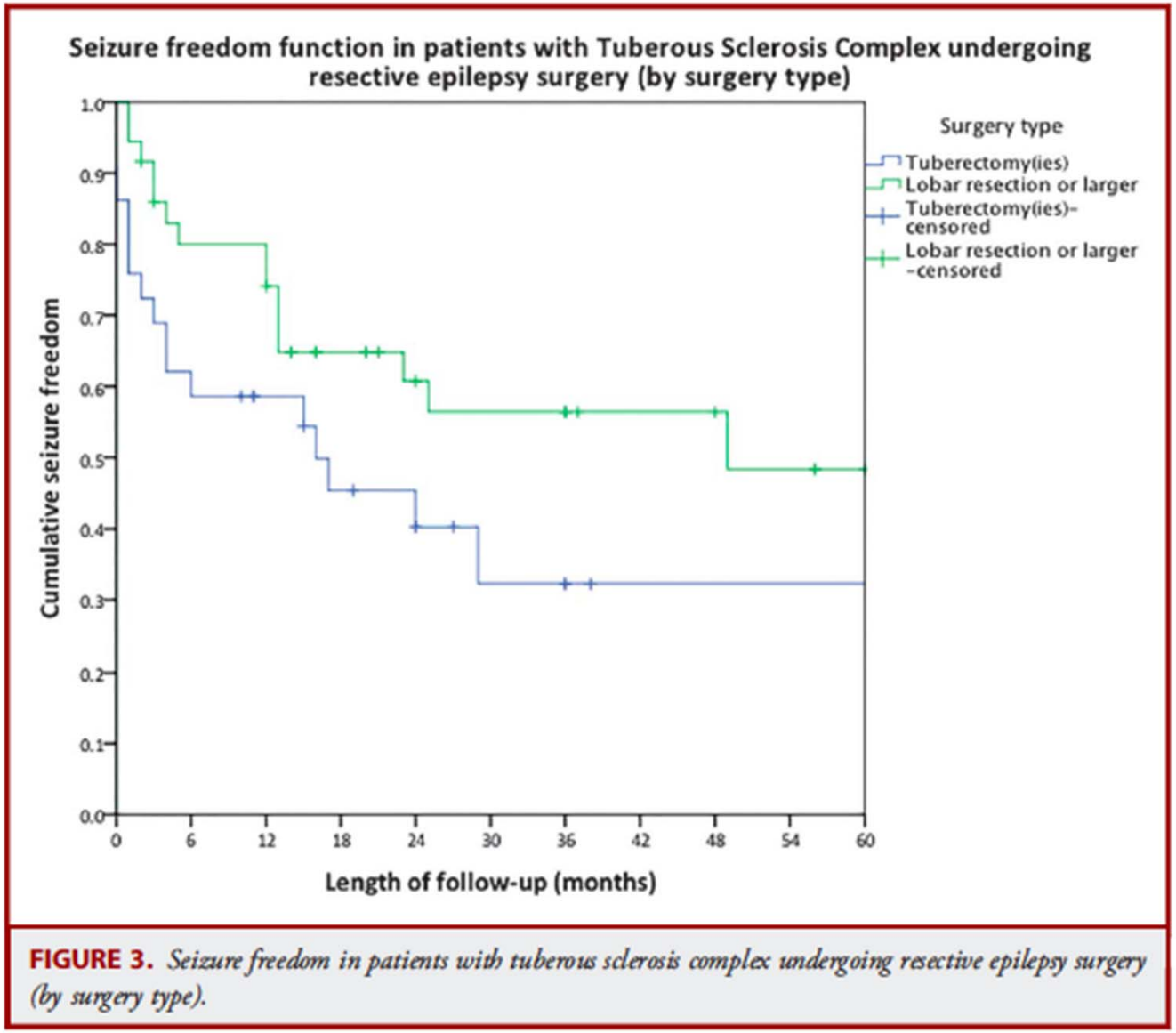

FIGURE 3. *Seizure freedom in patients with tuberous sclerosis complex undergoing resective epilepsy surgery (by surgery type).*

Tuberous Sclerosis

- In this large consecutive cohort of children with TSC and medically intractable epilepsy, a greater extent of resection (**more than just the tuber**) is associated with a greater probability of seizure freedom.
- This suggests that the epileptogenic zone may include the cortex surrounding the presumed offending tuber.

END