significant risk factor for severe cognitive impairment. Behavioral problems such as hyperactivity, aggression, and autistic traits occur in 50% cases.

The epileptic syndromes listed in differential diagnosis of LGS are Doose (myoclonic astatic epilepsy), Dravet (severe infantile myoclonic epilepsy), West (infantile spasms), and pseudo Lennox (atypical benign partial epilepsy). If diagnosis is not readily apparent from clinical history and exam, EEG, MRI, cardiac and eye exams, further tests suggested include DNA microarray, SLC2A1 (glucose transporter defect), CLN2 (late infantile neuronal ceroid lipofuscinosis), and TSC 1,2 (tuberous sclerosis). Diagnosis is important in determining prognosis and in treatment. (Bourgeois BFD, Douglass LM, Sankar R. Lennox-Gastaut syndrome: A consensus approach to differential diagnosis. **Epilepsia** 2014 Sep;55 Suppl 4:4-9).

COMMENTARY. A Working Group of experts chaired by Drs John M Pellock of Virginia Commonwealth University, Richmond, VA, and Dr James W Wheless of Le Bonheur Children's Hospital, Memphis, TN, met in Chicago, June 2012, and discussed diagnostic criteria and the management of LGS [1]. Investigators from Boston University; Tennessee, and Cincinnati, list FDA approved treatment options for LGS, including felbamate, lamotrigine, topiramate, rufinamide, and clobazam, and several others used off-label [2]. Investigators from Boston University and Kennedy Krieger Institute, Baltimore, outline surgical options that include lesionectomy and lobar resection, corpus callosotomy (effective in control of drop attacks), and vagus nerve stimulation [3]. Investigators from Johns Hopkins University and UCLA report a 50% response to treatment with the ketogenic diet and a similar response to vagus nerve stimulation [4]. The Director of Epilepsy Information Service at Wake Forest University, Winston-Salem, NC, lists resources for caregivers and families of patients with LGS. They include the LGS Foundation, Epilepsy Foundation, Child Neurology Foundation and CNS, Charlie Foundation, and TS Alliance [5].

**References.**


1. Pellock JM, Wheless JW. Epilepsia. 2014 Sep;55 Suppl 4:1-3.
2. Montouris GD, Wheless JW, Glauser TA. Epilepsia. 2014 Sep;55 Suppl 4:10-20.
3. Douglass LM, Salpekar J. Epilepsia. 2014 Sep;55 Suppl 4:21-8.
4. Kossoff EHW, Shields WD. Epilepsia. 2014 Sep;55 Suppl 4:29-33.
5. Gibson PA. Epilepsia. 2014 Sep;55 Suppl 4:34-36.


# NEUROCUTANEOUS SYNDROMES

## TUBEROUS SCLEROSIS COMPLEX AND ARACHNOID CYSTS

Investigators at the Massachusetts General Hospital, Boston, MA, and Universitat Autonoma de Barcelona, Spain, assessed the prevalence and characteristics of arachnoid cysts in a cohort of 220 patients with tuberous sclerosis complex (TSC). A review of brain MRIs found arachnoid cysts in 12 (5.5%) TSC patients compared to 0.5% in the general population. Ten (83.3%) were males. Four patients (33.3%) had also autosomal dominant polycystic kidney disease (ADPKD) due to a contiguous deletion of the TSC2-PKD1 genes. Three patients (25%) had 2 or more arachnoid cysts, of whom 2 also had ADPKD. One patient with an arachnoid cyst did not have tubers, subependymal nodules

or white matter migration lines. (Boronat S, Caruso P, Auladell M, Van Eeghen A, Thiele EA. Arachnoid cysts in tuberous sclerosis complex. **Brain Dev** 2014 Oct;36(9):801-6).

COMMENTARY. Arachnoid cysts may be part of the clinical spectrum of TSC. They originate from the cranial leptomeninges and dysfunction of the neural crest. Most are sporadic but some are familial, suggesting a genetic factor. The location is predominantly in the left temporal fossa but some are bilateral. Arachnoid cysts are also reported in neurofibromatosis type 1 [1], and Sturge-Weber syndrome [2].

**References.**
1. Boltshauser E, et al. Neurofibromatosis. 1989;2(5-6):274-7.
2. Ergun R, et al. Acta Neurochir (Wien). 2007 Aug;149(8):829-30.

## RIPPLES AND FAST RIPPLES AS MARKERS FOR EPILEPTOGENIC ZONE IN TS COMPLEX

Investigators from the Hospital for Sick Children, Toronto, Canada, and Okayama University Hospital, Japan, analyzed the high occurrence rate (OR) of interictal high frequency oscillations (HFOs) at 80-200 Hz (ripples) and >200 Hz (fast ripples, FRs). The resection ratios of high-OR ripples and high-OR FRs showed significant correlations with seizure outcome ($p=0.038$ and 0.048, respectively). Multiple extensive zones with high-OR HFOs suggest a complex and widespread epileptic network in TSC. In patients with drug-resistant epilepsy, resection of cortex with both interictal high-OR ripples and high-OR FRs on IVEEG correlated with a good seizure outcome. (Okanishi T, Akiyama T, Tanaka S, et al. Interictal high frequency oscillations correlating with seizure outcome in patients with widespread epileptic networks in tuberous sclerosis complex. **Epilepsia** 2014 Oct;55(10):1602-10).

COMMENTARY. A previous study by investigators at the Royal Children's Hospital, Melbourne, Australia, found interictal FR involved tubers in TSC more commonly than perituberal cortex but were not associated with electroclinically distinct seizures (EDS). Tubers play a greater role in seizure genesis than perituberal cortex, suggesting that tuberectomy may be a sufficient surgical approach in a number of TSC patients with seizures. Ictal fast rhythms at seizure onset were confined to tubers in 73% and involved tuber with perituberal cortex in 27% [1].

In a subset of TSC patients, the distribution of the epileptogenic zone propagates with time from a single focus at the onset of seizures to bilateral and multiple foci. The laterality of spikes during REM sleep on video EEG monitoring correlates with the epileptogenic hemisphere. The video EEG and MEG are helpful in identifying the epileptogenic zone among multiple cortical tubers [2].

**References.**
1. Mohamed AR, et al. Neurology. 2012 Dec 4;79(23):2249-57.
2. Okanisni T, et al. No To Hattatsu. 2014 Jul;46(4):257-63.