Syndrome	Classification	Clinical picture (AE)	EEG	Treatment	Prognosis
Neonatal/Infantile period					
Benign familial neonatal seizures (BFNS) ***fifth day fits***	**Partial/ Generalized**	**Onset**: First week after birth. **CP**: Clonic or myoclonic seizures *(AD inheritance - KCNQ2 and KCNQ3 mutation)*	focal or multifocal	No treatment needed	Usually stop by 6 wks. 16% risk of developing epilepsy.
Benign familial infantile seizures (BFIS)	**Partial**	Focal clonic seizure, Eye deviation, cyanosis Seizures often cluster	Occipital-parietal spikes	No treatment needed	Excellent, usually resolves in 1-2 years
Benign Myoclonic Epilepsy of Infancy	**Generalized**	**Onset**: 6m:3y Brief generalized myoclonic activity	Generalized spike/wave lasting 2-3 seconds	Valproate & Lamotrigine	Remission in most cases
Early Myoclonic encephalopathy (EME)	**Generalized**	**Onset**: first month of life Starts with erratic myoclonic jerks then simple focal sz then infantile spasms. Multiple metabolic causes identified.	Burst-suppression that evolve to hypsarrhythmia.	AED - Intractable	Poor, 50% die in few wks
Early infantile Epileptic encephalopathy (EIEE) ***Ohtahara syndrome***	**Generalized**	Tonic spasms - Often hundreds daily 75% have lesions in MRI *(Often arising from cortical dysplasia or associated with STXBP1 "Syntaxin binding protein" gene mutation)*	Burst-suppression	Surgical eval.	Poor - Can evolve into West syndrome or Lennox-Gastaut syndrome
Infantile spasms & ***West Syndrome***	**Generalized**	**Onset**: Infancy **Infantile spasms**: sudden jackknife-like movement, with flexion of the neck, trunk, limbs, and waist, occur in clusters **West syndrome**: Infantile spasms + developmental delay + hypsarrhythmia *(May be associated with cortical Dysplasia)* **Aicardi syndrome**: infantile spasms + agenesis of the corpus callosum + retinal lacunae	Hypsarrhythmia (high-amplitude, chaotic slow waves with multifocal spikes). Electrodecrement during spasms	Corticotrophin and vigabatrin.	Poor
Severe myoclonic epilepsy in infancy ***Dravet syndrome***	**Focal or Generalized**	**Onset**: first year, peak 2-8 months Focal or GTC seizures. Starts initially in setting of fever or vaccination; later, myoclonic and absence seizures Developmental arrest with onset of seizures *(SCN1A "Sodium channel 1A" mutation)*	Slow background, Multifocal or generalized spike-and-wave	Valproate, clobazam, ketogenic diet	Poor

Childhood period:					
Benign epilepsy with centrotemporal spikes ***Rolandic epilepsy***	**Partial**	**Onset**: School age, 15:25% of epilepsy in children **CP**: Nocturnal SPS with clonic contractions of upper face and UL, excessive salivation, gurgling or choking sounds.	Centro-temporal spikes with normal background.	No treatment needed. CBZ if frequent Sz	Resolves by puberty. 2/3 infrequent seizures
Childhood epilepsy with occipital paroxysms ***Panayiotopoulos***	**Partial**	**Onset**: 1-14 average 5 years **CP**: Nocturnal autonomic seizures of prolonged duration. Child is conscious but complains about feeling sick, **vomits,** turns pale, dilated pupils ±visual seizures, thermoregulatory alterations. Later they develop partial or GTCs	Interictal occipital spikes Increase in non-REM sleep	No treatment needed	20% develop ictal syncope w/wo convulsions
Idiopathic childhood occipital epilepsy of Gastaut		**Onset**: 3-14 average 8 **CP**: episodic blindness or colored luminous discs, visual hallucinations. lasting seconds or minutes; postictal migraine in one-third	Interictal high-amplitude spike-and-wave complexes occurring **with the eyes closed.**	CBZ	50% with positive FH of epilepsy
Acquired Epileptic Aphasia ***Landau-Kleffner Syndrome***	**Partial**	Onset: 3-8 years old focal seizure involving face or arm, usually diagnosed initially as BECTS then child develop acquired motor & sensory aphasia	Bilateral centrotemporal Spikes, increased during sleep	Valproate, Lamotrigine & steroids. Avoid CBZ & PHT	Variable – many children become permanently aphasic
Continuous Spike- -Wave Activity during Sleep (CSWS)		Onset: around 5 years Starts with partial or generalized seizures then develop epileptic encephalopathy.	ESES appears 2-3 years after onset.	Valproate, Lamotrigine & steroids	
Lennox-Gastaut syndrome	**Generalized**	Multiple seizure types (Tonic, atonic, absence) + Mental retardation + slow spike-wave (1.5 – 2.5 Hz)	Interictal: slow spike-and-wave patterns, ≤2.5 Hz	Valproate for all seizure types. Lamotrigine & felbamate for drop attacks	Poor
Myoclonic-astatic Epilepsy ***Doose Syndrome***	**Generalized**	**Onset**: around 3 years Myoclonic, atonic, tonic, and absence seizures Sz may start in the setting of infection/fever	Slow background, generalized spike-and-wave pattern	Valproate, Lamotrigine, Levetiracetam, Ketogenic diet	Variable 50% will attain seizure freedom and normal IQ
Childhood absence epilepsy	**Generalized**	Brief (few seconds) staring Episodes - Behavioral arrest May include automatisms No postictal state - Provoked by hypoglycemia and	3-Hz spike-and-wave pattern	Ethosuximide, valproate, and Lamotrigine. Dc'd if seizure	Excellent Often remits by teenage yrs Should be distinguished

		hyperventilation		free for 1-2 ys	from juvenile absence, atypical absence
Generalized epilepsy with febrile seizures plus **GEFS+**	**Generalized**	Febrile seizures; myoclonic, astatic, tonic-clonic, and absence seizures Strong FHx, variable penetrance *(AD. SCN1A, SCN1B, SCN2A, and GABARG2 mutations)*	Normal, generalized or focal spike-and-wave		Variable presentation within families from benign to catastrophic
AD Nocturnal Frontal Lobe Epilepsy (ADNFL)	**Partial**	**Onset**: variable, infants to elderly Brief hypermotor seizures (identical to those from SMA) that tend to cluster & occur mainly during sleep. Includes fist clenching, arm throwing, leg cycling, yelling, moaning, sleep walking. *(CHRNA encoding for nicotinic Ach Rc)*	Frontal sharp waves	Nicotine patch, Carbamazepine, Clonazepam	Can be misdiagnosed as night terrors or somnambulism.
Progressive Myoclonic Epilepsy	**Generalized**	Cognitive decline + tonic-clonic, tonic, or myoclonic seizures. Associated with: Lafora body disease, Unverricht-Lundborg disease (Baltic myoclonus), Neuronal ceroid-lipofuscinosis, MERRF		Valproate 1st Lamotrigine & Clonazepam 2nd line	
Eye lid myoclonia with absences (Jeavons Syndrome)		**Onset**: peak around 6 years **Triad of:** eyelid myoclonia with and without absences; eye closure-induced seizures and EEG paroxysms; and photosensitivity (to flickering light). **Eye lid myoclonia**: jerking of the eyelids with jerky upward deviation of the eyeballs and the head for few seconds.	Brief 3 to 6 Hz generalized poly-spike and wave discharge	Valproate, clonazepam & levetiracetam	

Adolescent/Adults:					
Juvenile Myoclonic Epilepsy	**Generalized**	**Onset**: usually teenage (8-24) Myoclonic seizures on awakening GTC – absence seizure Myoclonus can be triggered by reading, talking, photic stimulation	Generalized 4- to 6-Hz polyspike-and wave discharges in 75% of patients	Valproate, Lamotrigine. Levetiracetam, topiramate, and zonisamide can be tried.	Good but requires lifelong treatment
Epilepsy With GTC Seizures on Awakening	**Generalized**	**Onset**: 2nd decade GTC on awakening. May have absence or myoclonic seizures.		Similar to JME	
Idiopathic Photosensitive Occipital Lobe Epilepsy	**Reflex epilepsy**	**Onset**: during puberty. Occipital lobe seizures provoked by visual stimuli (TV, video games) mimic visual aura in migraine	Occipital or generalized spike-and-wave discharges enhanced with eye closure.	Avoiding triggers ± Valproate	
Rasmussen Encephalitis	**Partial**	Intractable and progressive focal seizures, hemiparesis, and cognitive regression. Slowly progressive cortical atrophy in MRI (Antibodies to glutamate receptor 3)			
Autosomal dominant frontal lobe epilepsy	**Partial**	Hyperkinetic seizures at sleep-wake Transition. May have aura of fear. *(CHRNA4 and CHRNB2 mutations)*	Normal or frontal spikes	Carbamazepine	Usually good response to treatment
Familial temporal lobe epilepsy	**Partial**	Lateral and mesial temporal forms	Temporal spike or sharp waves	Carbamazepine	Usually good response to treatment

Seizures that usually start in the setting of viral illness or fever: Febrile – GEF+ - Dravet – Doose

Seizures associated with spasms: Ohtahara – West – AICARDI

Causes of myoclonic seizures in children:

Early myoclonic encephalopathies (EME, EIEE),

Part of other generalized epileptic syndrome (Doose, Dravet, LGX),

Non-progressive myoclonic epilepsies (as benign neonatal myoclonic epilepsy, familial myoclonic epilepsy)

Progressive myoclonic epilepsies (8 types mentioned below).

Progressive Myoclonic Epilepsy Syndromes

Myoclonic Syndrome	Etiology	Onset	Features	Diagnosis	Treatment
Baltic Myoclonus (Unverricht-Lundborg disease)	AR - EPM1 mutation	Adolescence (6-16) In Baltic countries (Estonia, Latvia and Lithuania)	**Considered** as least severe type of PME **Seizures**: Myoclonic jerks, GTCs a, often misdiagnosed as JME in early stages **Others**: Cognitive decline is usually mild	Genetics testing	
Lafora body disease	AR - EPM2A – EPM2B Glycogen storage disease, accumulation of Lafora bodies (polyglucosan)	Adolescence (6-19) In Middle east countries	**Considered** a neurodegenerative disease **Seizures**: GTCs that responds to treatment while myoclonic jerks resistant to treatment. **Others**: Severe dementia and ataxia	Axillary skin biopsy – Genetic testing	Valproate – Zonisamide
Neuronal Ceroid Lipofuscinosis (NCL)	AR – CLN mutation Lysosomal storage disease, accumulation of lipofuscin pigments	Infantile → Late Infantile → Juvenile "Batten" → Adult "Kuf's" →	Starts with loss of vision and seizure (myoclonic & GTC) then severe developmental delay and death. Starts at 6m, blindness by 2 years and death by 4. Starts at 2 (Seizures and loss of vision), death at 10. Starts at 4 years and death by 20-30 years Starts at 30 years and death by 40 years	Skin biopsy – Genetic testing – Enzyme assay	Cystagon – Gene therapy
Sialidosis	AR – NEU1 mutation Lysosomal storage disease Deficient Sialidase leads to accumulation of mucolipids	Sialidosis II: 1st year Sialidosis II "Cherry red spot myoclonus":	**Coarse facial features** with large tongue, gums, buffy eyelids, hepatomegaly, splenomegaly, Immunodeficiency with recurrent infections. **Seizures**: myoclonic jerks, GTC Death in first year of life. Less severe, starts between 10-20 years with Loss of vision (Cherry red spot), ataxia, and severe myoclonus.	Deficient neuraminidase in fibroblasts– Genetic testing	
GM2 gangliosidosis (Tay-Sachs, Sandhoff, AB Variant)	AR – HEXA mutation Lysosomal storage disease ↓ activity of hexosaminidase leads to accumulation of gangliosides	in Ashkenazi Jews and Cajuns of Louisiana Infantile → Juvenile → Adult →	Marked developmental delay, seizures, child becomes blind (Cherry red spot), deaf, spastic and paralytic. All 3 disorders are identical – differ only in deficient enz. Starts at 6m, death at 4 years Starts at 2 years, death around 5-15 years Starts in adolescence with ataxia & spasticity, wheelchair bound in adulthood (misdiagnosed as Fredrick's Ataxia)	Enzyme essay – Genetic testing	
MERRF (Fukuhara disease)	Mitochondrial	Variable expression	Myoclonic epilepsy – exercise intolerance – lactic acidosis – hearing loss and poor vision – ataxia – dementia		

Hallerverden Spatz disease (PKAN) (NBIA1)	AR - PANK2 mutation	Before 10 years of age	Movement disorder: dystonia - athetosis – rigidity – tremors - Spasticity Seizures - Dementia	MRI with eye of tiger - Genetic	Limited success with Iron chelation & Pantothenate
DRPLA	AD – CAG expansion in Atrophin 1 gene	More common in Japan	**Ataxia** (dentate/rubral) – **Choreoathetosis** (pallidoluysian) – Seizures and **myoclonus** – dementia Juvenile onset: more pallidoluysian atrophy Adult onset: more dentate-rubral atophy		

Interesting details:

Lafora bodies: Polyglucosan is a glycogen with excessive phsophates and branching for excessively long intervals, due to either deficiency of Laforin enzyme which dephosphyralates normal glycogen and keeps it short or excess activity of glycogen synthase due to lack Malin that assists Protein phosphorylase to inactivate glycogen synthase.

Tay-Sachs carriers (have only one allele) are protected against tuberculosis

Cherry red spot: a common feature for all sphingolipidosis where sphingilipids accumulate in the ganglion layer of macular cells making it look pale, because the fovea lacks ganglion layer so it looks red in the middle of the macula.

Combination of Myoclonic epilepsy and cherry red spot makes Lysosomal storage disease the first thought.

NCL patients have Bull's eye macula (not cherry red spot); also they have marked loss of vision which helps with clinical diagnosis.

NBIA includes: PKAN – PLAN (PLA ass neurodegeneration) – MPAN (mitochondrial membrane protein) – BPAN (Beta propeller protein) – FAHN (Fatty acud hydroxylase) – CoPAN (CoA synthase protein) – aceruloplasminemia

Luysian in DRPLA refers to: subthalamic nucleus which is also called "Body of Luys" or "Corpus Luysii" in honor of French anatomist Dr Jules Luys.